



Case Report

Application of aromatherapy to treat PONV in patients post neurosurgery

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Abstract

Postoperative nausea and vomiting (PONV) stands as one of the most prevalent complications within the initial 24 hours following surgery, potentially extending the Length of Stay (LOS) and incurring elevated financial burdens for patients in hospital settings. Aromatherapy emerges as a non-pharmacological approach for alleviating PONV symptoms. This case study aims to evaluate PONV severity and manage symptoms in neurosurgical patients utilizing a nursing process approach. Employing a case study design integrated with a nursing process approach, this study was conducted. The inclusion criteria were respondents aged 18 or older, American Society of Anesthesiologist (ASA) I or II classification, undergoing neurosurgery under general anaesthesia, willing to participate, conscious (GCS: 14-15), with a healthy sense of smell, and PONV scores of 1 or 2. Exclusion criteria comprised discharged or deceased patients, absence of PONV, respiratory issues like asthma/COPD, odor allergies, and severe post-surgical complications. Dropout criteria included sudden emergencies or alternative interventions during PONV assessments. Results showed 4 patients with PONV 1 scores and 6 with PONV 2 scores before aromatherapy. After aromatherapy, 6 patients had PONV 0 scores, 2 had PONV 1 scores, and 2 had PONV 2 scores. Findings underscore alterations in PONV scores pre- and post-aromatherapy administration, highlighting the potential of this evidence-based nursing intervention to enhance patient comfort and mitigate postoperative complications in neurosurgical settings.

INTRODUCTION

Postoperative nausea and vomiting, also known as Post-Operative Nausea Vomiting (PONV), is one of the most common complications in the first 24 hours after surgery.¹ PONV can be found in up to 30% of hospitalised patients, with women experiencing twice as many as men.² According to the findings of another study, 42 percent of patients in a group of 100 had

PONV.¹ PONV can cause post-operative pain, fluid and electrolyte imbalances, and surgical sutures that become tense and open.² PONV has the potential to increase the Length of Stay (LOS), resulting in increased patient financing in hospitals.

The development of PONV prediction using a scoring system simplifies PONV

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prophylaxis and management. The Patel and Koivuranta scores, according to ASPAN's (American Society of Perianesthesia Nurse) guidelines for the prevention and/or management of PONV, can be used to assess patient groups based on their risk for PONV. The results revealed that the Apfel score had a higher strength value than the Koivuranta score.²

Aromatherapy is one of the non-pharmacological treatments for PONV. Aromatic oil particles directly affect the central nervous system, autonomic nervous system, endocrine system, and immune system, resulting in a therapeutic effect on the body.³ According to the findings, aromatherapy can cause mild allergic reactions, nausea, and headaches.⁴

The National Brain Center Hospital is a type A referral hospital that specialises in the diagnosis and treatment of neurological disorders. According to the findings of a preliminary study, most neurosurgery is performed under general anaesthesia, which increases the risk of PONV. Nurses play an important role in providing care to patients, particularly in meeting basic human needs. This application's goal is to determine the PONV score and manage PONV in patients undergoing neurosurgery surgery.

Based on this information, the Apfel score can be used as a risk assessment for PONV, and aromatherapy has few benefits and side effects as a treatment for PONV. Both of these non-invasive actions are associated with decreasing the stimulus in the patient in order for them to achieve an adaptive state.

METHODS

The method employed in this case study is a descriptive study conducted through the nursing process approach, which begins with assessment, formulation of nursing problems, planning nursing interventions, implementing interventions, and

conducting nursing evaluations at the end. This application's sample calculation employs the NNT (Number Needed to Treat) method. Based on the calculation results, the number of samples in the application is 10 patients. The inclusion criteria of respondents in the application of EBN are age 18 years, ASA I or II, type of neurosurgery surgery with general anesthesia, agree to participate in the implementation of EBN, fully aware (GCS: 14-15), have a healthy sense of smell based on the report patients and investigators examination, patients with a PONV score of 1 or 2. As for the exclusion criteria, namely the patient went home or died, the patient did not have PONV, the patient had respiratory problems such as asthma / COPD, the patient had an allergy to certain odors, the patient had severe complications post-surgery. The drop out criteria in the application of this EBN, namely a sudden emergency occurs in the patient, the patient is taken another action when the PONV measurement will be carried out again.

The implementation procedure for this application has several stages, namely the preparation stage and the implementation stage. In the preparatory stage, patients who meet the inclusion criteria will receive intervention. At this stage, the patient gets an explanation of the procedure, goals and benefits of the intervention. The patient then filled out an informed consent form and continued with a PONV risk assessment using the Apfel score. Four things that become indicators in measuring the Apfel score are female gender, history of PONV or motion sickness, not smoking and use of opioids.

At the implementation stage of the implementation, there are two stages: the Apfel score measurement stage and the intervention stage. Stage of Apfel score measurement with the following interpretation: Scores 0-1 indicate low risk, 2 indicate moderate risk, and 3-4 indicate high risk. The intervention phase consists of examining the patient's health record,

assessing the patient's neurological status, ensuring that the patient has no contraindications for aromatherapy (contraindications include: smell disturbances, respiratory system disorders, patients allergic to certain odours), and assessing the patient's complaints related to PONV (patients with a score of 0 do not experience nausea or vomiting).

The intervention phase consists of examining the patient's health record, assessing the patient's neurological status, ensuring that the patient has no contraindications for aromatherapy (contraindications include: smell disturbances, respiratory system disorders, patients allergic to certain odours), and assessing the patient's complaints related to PONV (patients with a score of 0 do not experience nausea or vomiting. Patients with score 1 experience nausea but do not vomit. Patients with a score of 2 experience nausea and vomiting. Tools and materials prepared are: ginger essential oil, gauze pad (gauze) measuring 5x5 cm, gloves, giving therapeutic greetings, identifying nursing plans, identifying patients using two identities, namely name and date of birth, explaining goals and procedures, washing hands and wearing gloves, adjusting a comfortable position for patients, dripping 3 drops of aromatherapy ginger or lavender essential oil on a gauze pad, recommending patients to inhale essential aromatherapeutic oil.

The type of ginger aromatherapy used was in the form of 10 ml packaged essential oil containing *oleum zingiber officinale* rhizome. The lavender aromatherapy type used was in the form of 5 ml pure essential oil containing *Lavandula angustifolia*. Both types of aromatherapies can be used by inhaling directly or dripping into a diffuser.

RESULTS

The results of the application are described in the following table which consists of patient characteristics and the results of the evaluation of the application that have been carried out. The implementation is carried out from February 7, 2022 to March 31, 2022 in the PACU room and surgical ward of National Brain Center Hospital Prof. Dr.dr. Mahar Marjono Jakarta. Based on the table and graph above, it can be concluded that the PONV Score of 6 patients experienced a decrease in PONV Score and 4 patients did not experience a change in PONV Score in the minute 15 and 40 measurements.

Based on Table 2 shows that most of the gender are female (80%). Apfel Score is medium risk 60%, while a high risk 40%. Based on Table 5.3 shows that the aromatherapy pre-treatment, PONV Score 1 was 4 patients and PONV 2 score was 6 patients. While the post-treatment aromatherapy showed PONV Score 0 as many as 6 patients, PONV Score 1 as many as 2 patients and PONV Score 2 as many as 2 patients. These results indicate that there is a change in PONV Score before and after giving aromatherapy.

Table 1
Characteristic Patients

Patient number	Age	Gender	Medical Diagnose	Types of Surgery	Apfel Score	PONV Score	PONV Score number-15'	PONV Score number-40'
Patient 1 (P1) Ginger	33	Female	Trigeminal neuralgia	MVD	2	2 (17.30)	0 (17.50)	0 (18.30)
Patient 2 (P2) Lavender	18	Female	Bone defect	Cranioplasty	2	2 (13.06)	0 (13.20)	0 (13.50)
Patient 3 (P3) Ginger	50	Female	HNP L5-S1	Microdisectomy	3	2 (12.30)	0 (13.20)	0 (13.45)
Patient 4 (P4) Ginger	45	Female	Vestibular schwannoma	Craniotomy removal tumor	3	2 (13.50)	2 (14.10)	2 (14.35)
Patient 5 (P5) Ginger	62	Male	OPLL servical C4-5-6	ACDF	3	1 (16.45)	0 (17.05)	0 (17.30)
Patient 6 (P6) Ginger	61	Female	HNP C3-4, C4-5, C5-6	ACDF + laminectomy	2	2 (18.43)	0 (19.03)	0 (19.28)
Patient 7 (P7) Lavender	60	Female	Hemifacial Spasm	MVD	2	2 (09.50)	2 (10.10)	2 (10.30)
Patient 8 (P8) Lavender	39	Female	Spondylitis TB VTh7-8	Laminektomy + Posterior Stabilization	2	1 (15.24)	1 (15.30)	1 (16.10)
Patient 9 (P9) Ginger	48	Female	Thoracic Compression Fracture 6-7	Posterior Fixation	2	1 (15.29)	1 (15.50)	1 (16.15)
Patient 10 (P10) Lavender	42	Male	Acute epidural hematoma	Craniotomy	3	1 (16.20)	0 (16.40)	0 (17.05)

Table 2

Distribution of Characteristic Patient Based on Gender and Apfel Score (n=10)

Variable	n	%
Gender		
Male	2	20
Female	8	80
Apfel Score		
Medium risk	6	60
High risk	4	40
Total	10	100

Table 3

PONV Score Sebelum dan Aromatherapic post-treatment (n=10)

PONV Score	Pre-intervention of Aromatherapy	Post-intervention of Aromatherapy
Score 0	0	6
Score 1	4	2
Score 2	6	2

DISCUSSION

PONV has a complicated etiology that is influenced by several factors including age, gender, obesity, previous history of PONV, history of motion sickness, smoking, use of opioids during and after surgery, type of anaesthesia, surgical technique, and postoperative pain.⁵ Four of these risk factors are used to calculate the Apfel Score: female gender, a history of PONV or motion sickness, not smoking, and opioid use. The

majority of patients in the application have an Apfel Score of 2-3 (medium risk-high), which can be used to predict the occurrence of PONV. The risk factors in the Apfel Score are explained using percentages as follows: 1 risk factor has a 21% chance of developing PONV, 2 risk factors have a 39% chance of developing PONV, 3 risk factors have a 61% chance of developing PONV, and 4 risk factors have a 70% chance of developing PONV.⁶

According to the findings of this application, the percentage of PONV incidence in the age range of 18 – 62 years ranged from 5 patients (62.5 percent) to 3 patients (37.5 percent). These findings are consistent with previous research indicating that the adult age group is more likely to experience PONV, and late adult age is known to be easier to control nausea and vomiting than early adult age.⁷ Studies have identified with adult females being three times more likely to experience PONV compared to adult males.⁸

The majority of patients in this application are female. According to physiology, oestrogen can activate dopamine receptors in the Chemoreceptor Trigger Zone (CTZ), thereby speeding up afferent signals sent to the Central Vomiting Center (CVC) and then through the Vagus nerve as an efferent pathway, resulting in a nausea or vomiting reflex.⁷ Studies also have identified female gender as a significant risk factor for PONV.⁸

Preoperative evaluation Patient number one had a medical diagnosis of trigeminal neuralgia, a blood pressure of 118/67mmHg, a heart rate of 98 beats per minute, a respiratory rate of 20 beats per minute, and a saturation of 100 percent. The patient underwent 5.5 hours of MVD surgery. At 14.00, the patient was given 4mg of ondansetron in the operating room. PONV struck the patient at 17.00, 3.5 hours after surgery or 3 hours after antiemetic administration. Patient number two underwent cranioplasty surgery. The surgery took 2.5 hours and took place on March 10, 2022. Patient arrived in the PACU at 12.00 and appeared on PONV at 13.05.

Preoperative information Patient 3 has an Apfel Score of 3 (high risk). Microdiscectomy was performed on a patient with a medical diagnosis of L5-S1 lumbar HNP. The patient was given general anaesthesia with fentanyl 200mcq (IV) pre-induction and recool 50mg (IV) and sevoflurane 1.5 percent (inhalation) induction. The patient underwent surgery

for 3 hours. Patient entered the PACU at 10:00 and received a 4mg ondansetron injection in the operating room at 09.45. Patient appeared PONV at 12.30, 3.5 hours after surgery. Preoperative evaluation Patient number 5 had an ASA 2 and an Apfel Score of 2. (medium risk). ACDF surgery was performed on a patient with the medical diagnosis of OPLL C4-5-6. On March 14, 2022, the patient entered the PACU and was transferred to the inpatient room at 10.25 a.m. PONV appeared 6 hours after surgery with a PONV Score of 2. Preoperative information Patient number 6 had an Apfel Score of 2 (medium risk), and had the following medical diagnoses: HNP C3-4, C4-5, and C5-6. On March 16, 2022, the patient underwent surgery with the type of operation ACDF + laminectomy. General anaesthesia is the type of anaesthesia used. The patient was in the operating room for 6 hours. At 14.00 (in the operating room), the patient received a 4mg ondansetron injection, followed by an omeperazole injection at 16.00. (in the PACU). PONV appeared 5 hours after surgery at 19.00. Prior to the aromatherapy intervention, the vital signs were as follows: BP 98/66mmHg, HR 55x/minute, RR 10x/minute, and 100% SpO2. After aromatherapy intervention, vital signs were 115/67mmHg, HR 56x/minute, RR 9x/minute, and SpO2 100 percent. Patient number 8 is a patient with TB spondylitis VTh 7-8 who underwent laminectomy and posterior stabilisation surgery on April 5, 2022. Preoperative data show an Apfel Score of 2 and the patient is receiving active TB treatment. Patient underwent 4 hours of general anaesthesia surgery, entered the PACU at 12.15, and had previously received an omeperazole injection at 12.00. At 14.11, the patient was given a weaning ventilator (extubation). At 15:20, the patient appeared on PONV with a score of 1.

The majority of patients experienced PONV within the first 6 hours after surgery. This is consistent with the theory that PONV is a common side effect of general anaesthesia that manifests as nausea, vomiting, or both

in the first 24 hours after surgery.⁶ The type of surgery and patient factors both play a role in the occurrence of PONV.⁹ The factors such as preoperative physical status and type of surgery have been identified as potential risk factors influencing the onset of PONV within the initial hours after surgery.¹⁰ The pathophysiology of the occurrence of PONV in general anaesthesia is the activation of proemetic substances in the blood circulation or in the cerebrospinal fluid in all patients who received (CSF). This condition causes an efferent signal from the Chemoreceptor Trigger Zone (CTZ) to be sent to the Central Vomiting Center (CVC), and then there is a series of sympathetic-parasympathetic reactions that end in a nausea or vomiting reflex via the Vagus nerve as an efferent pathway.¹¹

Ondansetron 4 mg was given to the patient as antiemetic therapy. Patients were given antiemetics after surgery and before being transferred to the PACU, so that most of the patients appeared PONV when the half-life of the antiemetic was reached, which was 3.5-5.5 hours for ondansetron.¹²⁻¹⁴

In the application, a total of 8 patients underwent surgery lasting more than 60 minutes. According to the literature, the longer the patient is in contact with the anaesthetic, the longer the neuromuscular blockade will occur, causing vestibular disequilibrium. This equilibrium can result in additional CTZ activation via the vestibular nerve, resulting in PONV.⁷ The understanding of neuromuscular blockade duration and its potential consequences on patient outcomes is essential in perioperative care.¹⁵

Five patients chose ginger aromatherapy, four chose lavender aromatherapy, and one patient chose eucalyptus aromatherapy. Aromatherapy is chosen based on the patient's interest in the various types of aromatherapies available. Aromatherapy works directly in inhibiting the function of 5-HT receptors in activating CTZ in the central nervous system and inhibits the

work of cholinergic and histamine receptors in the intestine to produce a relaxing effect that can reduce nausea and vomiting. Because this procedure is quick, the effects of aromatherapy can be evaluated 15 minutes after the intervention. This mechanism is supported by the nature of aromatherapy molecules, which are lipophilic and quickly bind to olfactory receptors, causing neurochemical reactions. These neurochemical reactions are transmitted through the olfactory nerves to the brain's olfactory bulb, limbic system, and thalamus, where they cause the release of endorphins, serotonin, and dopamine neurotransmitters, which have a calming effect, increase comfort, and reduce anxiety.¹⁶

The authors prepare risk management during the EBN implementation process in order to anticipate or minimize unexpected events. Nurses performed several risk management actions, including ensuring the patient's hemodynamics were stable, asking the type of aromatherapy desired by the patient, and observing the patient's condition and response during the EBN implementation process. Patient responses during EBN implementation included, among other things, feeling more comfortable, reducing nausea and vomiting, and maintaining stable hemodynamics.

During the perioperative period, nurses play a critical role. The nurse's responsibilities include determining the patient's risk of PONV events, documenting the types of prophylaxis and patient medications, planning nursing care, and educating the patient about the risk of PONV.¹⁷ Based on this, it is possible to conclude that the risk score assessment aids in the early detection and prevention of PONV, which has an impact on the quality of patient care.

The fact that there are various types of aromatherapies is a limitation during the implementation process. Ginger aromatherapy, lavender aromatherapy, and

eucalyptus aromatherapy were among the aromatherapy types used during the implementation process. This is because the patient has a varied interest in various types of aromatherapy.

CONCLUSION

Based on the process and results of the EBN implementation, it is possible to conclude that (1) postoperative aromatherapy can reduce PONV Score in neurosurgery patients and (2) aromatherapy SOPs are simple to apply to PONV patients. The use of EBN in aromatherapy to treat PONV can be considered a complementary therapeutic procedure. The findings of this EBN can be widely used to provide an overview of nursing interventions that can be performed on patients following neurosurgery surgery in order to increase postoperative patient comfort and minimize postoperative complications.

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CONFLICT OF INTEREST

Neither of the authors has any conflicts of interest that would bias the findings presented here.

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