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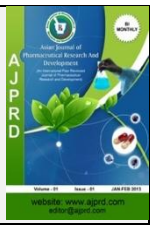

Open Access Research Article

Comparison of the Effects of Peppermint Aromatherapy and Intravenous Ondansentron on The Incidence of Postoperative Nausea and Vomiting (Ponv) Laparotomy with General Anesthesia

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A B S T R A C T

Background: Postoperative nausea and vomiting is known as Post Operative Nausea And Vomiting (PONV). Postoperative nausea and vomiting (PONV) is multifactorial and is strongly influenced by physiological factors. PONV was defined as nausea and/or vomiting occurring 24 hours postoperatively. Non-pharmacological/complementary therapies that can be used to prevent and reduce postoperative nausea and vomiting include aromatherapy. Peppermint aromatherapy can be a quick onset alternative to antiemetic therapy and is easy to administer. **Objective**: The purpose of this study was to determine the difference between the effects of peppermint aromatherapy and intravenous ondansetron on the incidence of postoperative nausea and vomiting (PONV) laparotomy with general anesthesia at H. Adam Malik General Hospital Medan and Network Hospital. **Methods**: This study is a clinical trial and uses a double-blind randomized controlled trial study design on subjects who underwent laparotomy surgery under general anesthesia at Haji Adam Malik Hospital and Network Hospital with 36 people with patients aged 18-65 years with ASA 1 and 2 physical status, who underwent laparotomy surgery under general anesthesia. **Results**: Statistically, there was a significant difference in PONV scores between the peppermint and ondansetron groups occurring at time T1 (15 minutes after treatment), where the p-value <0.05. Meanwhile, at times T0, T2, T3, there was no statistically significant difference in the PONV scores between the two groups, where the p-value> 0.05. **Conclusion**: Peppermint aromatherapy was better at reducing postoperative laparotomy with general anesthesia than standard intravenous 4 mg of ondansetron therapy, especially in the early minutes after surgery.

Keywords : PONV, Peppermint, Ondansentron.

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INTRODUCTION

Postoperative nausea and vomiting is known as Post Operative Nausea And Vomiting (PONV). Postoperative nausea and vomiting (PONV) is multifactorial and is strongly influenced by physiological factors. PONV was defined as nausea and/or vomiting occurring 24 hours postoperatively. PONV occurs 33 % of all patients that went surgery with general anesthesia (70-80 % on high risk patients)[1-3].

The incidence of PONV reached 30% of the more than 100 million surgical patients worldwide [4]. Each year, 71 million general surgery patients in the United States experienced20–30% incidence of PONV and approximately 70–80% in high-risk groups [5]. In Indonesia, the incidence of PONV has not been clearly recorded. Based on the research of Wijaya, et al (2014) the incidence of PONV in laparotomy and gynecology surgery was 31.25% and mastectomy surgery was 31.4% [6]. The results of the study by Sholihah, et al (2015) also reported that of 96 patients, 26 patients (27.08%) had PONV [4]. While the incidence of nausea in the first 2 hours postoperatively in the PACU (Post Anesthesia Care Unit) reaches 20% and vomiting is 5%, while in the next 2 hours to 24 hours after surgery the incidence of nausea reaches 50% and vomiting 25%[7].

The occurrence of complications of PONV could cause new problems if not treated immediately. Therefore, it is important for the anesthesiologist to properly understand the condition of nausea and vomiting experienced by the patient and how to handle it to prevent further effects of PONV [8]. The treatment of PONV can be done pharmacologically with antiemetic and non-pharmacological drugs. Several types of pharmacological antiemetics that can be used in the management of PONV include gastrointestinal prokinetic drugs, which increase gastric and upper intestinal motility with antidopaminergic action (metoclopramide; phenothiazine, perphenazine); butyrophenone (droperidol), and 5-HT3 antagonists (ondansetron or tropisetron)[2].

Another alternative that can be used to treat PONV is non-pharmacological therapy. One of the non-pharmacological/complementary therapies that can be used to prevent and reduce postoperative nausea and vomiting is using aromatherapy [8]. One of the plant sources used as aromatherapy, among others, comes from the peppermint plant. Aromatherapy from peppermint plant material is one of the aromatherapy that can be used to relaxing cramped muscles, improving digestive disorders, reducing nausea and vomiting, and overcoming the inability to flatus [9-10].

Peppermint (Metha piperita) is an aromatic herb that has several physiological effects such as antiemetic, antispasmodic, choleretic, relaxation of the esophageal sphincter and sphincter of Oddi, anti-inflammatory, analgesic, antimicrobial, antiseptic, antifungal, anticancer, antiparasitic, antitussive, expectorant, decongestant, astringent, antipruritic, as a vasodilator, reducing the skin heat without changing the temperature threshold in the skin andhas a calming psychological effect. Peppermint aromatherapy can be an alternative to antiemetic therapy with rapid onset and easily administered[3,11-12].

Several studies have been conducted to determine the effect of peppermint aromatherapy on the incidence of nausea and vomiting [3,10,13]. Showed a significant decrease in the incidence of postoperative nausea and vomiting in the peppermint group compared to the ondansetron group ($p<0.05$) and it was concluded that peppermint aromatherapy was better than standard ondansetron 4 mg intravenous therapy as rescue therapy for post-mastectomy nausea and vomiting [14].

Thus, based on the background and research references above, the researcher wanted to assess the comparison of the effects of peppermint aromatherapy with intravenous ondansetron on the incidence of postoperative nausea and vomiting (PONV) laparotomy under general anesthesia at H. Adam Malik Hospital Medan.

Methods

After the approval by the Sumatera Utara University of Medical ethics committee, this study was performed as *double blind randomized controlled trial* to determine the difference between the effects of peppermint aromatherapy and intravenous ondansetron on the incidence of postoperative nausea and vomiting (PONV) laparotomy with general anesthesia at H. Adam Malik General Hospital Medan and Network Hospital.All patients aged 18-65 years, with ASA class 1 dan 2, underwent elective laparotomy surgery with general anesthesia and 6-8 hours fasting, were included.The data was collected between August 2020 and October 2020. Patients that took antiemetic before surgery, have history of allergy of peppermint, history of gastritis or others gastrointestinal disorders and any smelling or breathing disorder, were excluded. And criteria of drop out, subjects that have nausea and vomiting with hypotension and severe pain postoperatively. The study process was clarified and all patients provided written informed consent.

The standardization of the numerical rating scale (NRS) for the assessment of the nausea and vomiting scale was done by the residents who perform research procedures. The NRS assessment was used to determine the degree of postoperative nausea and vomiting which was categorized into severe, moderate, mild, and absent based on a score of 0-3. The assessment of the incidence of nausea and vomiting was based on the time of treatment, namely before treatment, 15 minutes after treatment, 30 minutes after the first treatment, and 60-120 minutes after the first treatment.

Randomization was done by block method, each sequence consisted of 6 subjects, with a total of 20 possible sequence combinations. Group A was the group that received peppermint aromatherapy, and group B was the group that received Ondansetron therapy. And then drop the pen over a random number. The pair of numbers pointed to / closest to the pen point is the starting number to determine the appropriate sequence. Then the 5 pairs of numbers below are selected from the first pair of numbers so that the number of sequences is obtained that corresponds to the large number of samples. The sequences obtained are arranged sequentially according to the envelope number.

Once the patient arrivedin waiting room, the patient was re-examined the identity, diagnosis, action plans anesthesia, infusion access (make sure it was installed with a threeway infusion and infusion flow smoothly). Then the patient was taken to the operating room, then a standard monitoring was done (ECG, blood pressure, heart rate, respiratory rate, oxygen saturation). General anesthesia was administered with premedication of 2 mg midazolam, induction with fentanyl 2 mcg/kgBW, propofol 2 mg/kgBW, and rocuronium 1 mg/kgBW. Then intubated using a size 7.0 ETT with a cuff (+). Maintenance of anesthesia was induced by giving inhaled gas isoflurane 1-1.5 vol% with O2 and water 2:2.

After surgery, the patient was assessed, the peppermint group was given the first intervention, a mask that had been dripped with peppermint aromatherapy was placed on the patient, then the patient was instructed to breathe deeply 3 times. After that, the patient was given an injection of 2 ml of 0.9% NaCl slowly for 30 seconds, then the nausea and vomiting scale was assessed after 15 minutes. If the patient is still nausea or vomiting, a second intervention is given by re-inhaling the mask 3 times. Then assessed the scale of nausea and vomiting at 30 minutes after the first intervention.

The same intervention was given again 60-120 minutes after the first intervention, just before the patient was transferred from the recovery room to the treatment room, then reassessed the nausea and vomiting scale.

In the intravenous ondansetron group, for the first intervention, the patient was instructed to inhale a mask that had been dripped with 0.9% NaCl as much as 3 drops and given 2 ml (4mg) of ondansetron injection slowly for 30 seconds. Then, the nausea and vomiting scale was assessed after 15 minutes. If the patient is still nausea or vomiting, a second treatment is given by inhaling the mask 3 times. Then assessed the scale of nausea and vomiting at 30 minutes after the first intervention. The same intervention was given again 60-120 minutes after the first intervention, just before the patient was transferred from the recovery room to the usual treatment room, then reassessed the nausea and vomiting scale.

The results of the observational data in the two groups were compared statistically. The study would be stopped if the subjects refused to participate further, the surgery was prolonged so that additional general anesthetic drugs were needed, and there was a life-threatening incidences.

The numerical data are shown as mean and SD (standard deviation), while categorical data is shown as sum (percentage). Demographic data were calculated using the Fisher's Exact Test, while for categorical data using the Chi-Square test. The comparison between the groups was performed using the Mann-Whitney test. 95% confidence interval with $p<0.05$ was considered significant. After the required data has been collected, then the data is checked againbefore being tabulated and processed. Then the data is coded to make it easier to tabulate. The data is tabulated into a master table using SPSS.

RESULTS

Subject Characteristics

A total of 36 patients who had met the inclusion criteria enrolled in this study. Characteristics of patients groups presented in the form of frequency, mean with standard deviation, and median with minimum and maximum values shown in Table 1.

Based on Table 1, the characteristics of the subjects from 36 research samples are known. In the group that received peppermint inhalation, 8 patients were male (44%) and female samples were 10 patients (56%) with a mean age of 45.8±11.7 years. Meanwhile, in the group receiving intravenous ondansetron, the male and female samples were the same, 9 patients (50%) each with a mean age of 41.9±16.4 years. The details of the demographic characteristics of the study groups can be viewed in Table 1.

From the results of statistical tests, for the characteristics of age, gender, BMI, MAP and duration of surgery, there was no significant difference between the two groups, this was indicated by the p value > 0.05. In other words, these two groups are considered homogeneous. Meanwhile, based on PS ASA, there was a significant difference between the two groups with $p < 0.05$.

Table 1: Characteristic of patients groups

Characteristic	Groups		p value
	Peppermint (n=18)	Ondansentron (n=18)	
Age (years, mean±SD)	45,8 ± 11.7	41,9 ± 16.4	0,210[a]
Sex			
Male (n, %)	8	9	0.425[b]
Female (n, %)	10	9	
BMI	23,5 ± 2,19	23,5 ± 2,75	0,512[a]
MAP	88,3 ± 5,6	86,7 ± 5,36	0.370[a]
ASA			
1	4	7	0,001
2	14	11	
Operation time (minutes)	176,6 ±□ □ □ □ □	181,6 ±□ □ □ □ □	0,217[a]

[a]T-test independent, [b]Chi-square

Comparison of the incidence of PONV between the Peppermint Inhalation Group and the Intravenous Ondansetron Group in Laparotomy Patients

Comparison of the incidence of PONV between the inhaled peppermint group and the intravenous ondansetron group in laparotomy patients at T0 (after extubation), T1 (15 minutes), T2 (30 minutes), and T3 (60-120 minutes) is shown in Table 2.

Table 2: Comparison of the incidence of PONV between the Peppermint Inhalation Group and the Intravenous Ondansetron Group in Laparotomy Patients

Median (min-max)	**Intervention**		**p value**[c]
	Peppermint (n=18)	Ondansentron (n=18)	
T0 (*Baseline*)	1 (1-2)	1 (1-3)	
Mild	14	12	
Moderate	4	5	0,417
Severe	0	1	
T1 (15 minutes)	0 (0-1)	0,5 (0-2)	
Absent	15	10	
Mild	3	7	0,033*
Moderate	0	1	
Severe	0	0	
T2 (30 minutes)	0 (0-1)	0 (0-2)	
Absent	11	11	
Mild	7	5	0,796
Moderate	0	2	
Severe	0	0	
T3 (60-120 minutes)	0 (0-1)	0 (0-1)	
Absent	17	15	
Mild	1	3	0,999
Moderate	0	0	
Severe	0	0	

Statistically, a significant difference in PONV scores between the peppermint group and the ondansetron group occurred at time T1 (15 minutes after treatment), where the p value <0.05. Meanwhile, at T0, T2, T3, there was no statistically significant difference in PONV scores between the two groups, where p value > 0.05.

DISCUSSION

The incidence of postoperative nausea and vomiting is influenced by various factors, both patient factors, such as age, gender, BMI, history of motion sickness, history of postoperative nausea and vomiting, history of chemotherapy, anesthetic factors, such as anesthetic drugs and for example the duration of surgery and type of surgery, such as laparotomy[1,8]. These factors influence the pathways and receptors in the CTZ area in the central nervous system and vagal afferent pathways in the peripheral nervous system for the occurrence of the nausea and vomiting reflex[14-15]. The higher the risk factors for nausea and vomiting will affect the percentage of postoperative nausea and vomiting. The characteristics of the patients in this study explained the risk factors for postoperative nausea and vomiting in research subjects in the recovery room and statistical results were not significantly different (p>0.05) in the two treatment groups. This explains the homogeneity of the research sample in the two groups and both groups deserve to be compared with further statistical hypothesis testing.

The results of this study proved that peppermint was more quickly reducing the incidence of nausea and vomiting in research subjects compared to ondansetron which was assessed from the NRS nausea and vomiting rating scale. This can be seen from the results of the descriptive analysis in the peppermint group that more than half of the samples experienced a decrease in the nausea scale at the 15th minutes after treatment, 14 patients complaining of mild symptoms and 4 patients with moderate symptoms, 15 patients did not complain of nausea and vomiting and 3 patients mild symptoms at 15 minutes after the first treatment. From the results of statistical analysis using the Mann Whitney Test in the peppermint group, the incidence of nausea and vomiting in the 15th minute experienced a significant or statistically significant difference.

The pathophysiology of nausea and vomiting includes a variety of pathways and receptors in the central and peripheral nervous systems. The five innervation pathways include the CTZ pathway, the vagus afferent pathway from the visceral gastrointestinal tract, the vestibular system innervation pathway, the cerebral cortex afferent reflex pathway, and the midbrain afferent pathway which is stimulated by various risk factors from the patient, anesthesia and surgery, thus activating the vomiting center which is located in the reticular formation in the medulla oblongata to occur postoperative nausea and vomiting reflex.

Peppermint aromatherapy works directly by inhibiting the

function of 5-HT receptors in the chemoreceptor trigger zone (CTZ) area of the central nervous system as well as 5-HT3 receptors in the gastrointestinal tract and inhibiting the work of cholinergic and histamine receptors in the intestine, and inhibiting calcium channels that cause relaxation of the gastrointestinal system so that can reduce nausea and vomiting. Inhaled peppermint aromatherapy affects the body and mind by interacting with the olfactory system which directly affects brain function. Some of the aroma components of peppermint oil pass through the lungs and through the blood vessels to the central nervous system after crossing the blood-brain barrier. Peppermint oil aroma molecules are lipophilic and will quickly bind to olfactory receptors in the nasal epithelium resulting in neurochemical reactions that are transmitted through the olfactory nerves to the olfactory bulbs in the brain, limbic system and through the thalamus to release endorphins neurotransmitters, as well as serotonin and dopamine, thus providing a psychological effect on emotions, thoughts, suggestions for calming and reducing anxiety, as well as being absorbed by the central nervous system, autonomic nervous system or endocrine system in the brain to provide antiemetic effects[12,14,15]

Another cause that caused the incidence of nausea and vomiting in the peppermint group to be smaller than that in the ondansetron group was the difference in the onset of action of the two treatment ingredients. The onset of action of peppermint is faster with an immediate effect up to 5 minutes after administration compared to ondansetron with a slower onset, which is about 30 minutes. The mean peak plasma of ondansetron reached its maximum effect about 90 minutes after administration, causing a significant difference in the decrease in the incidence of nausea and vomiting at each treatment time. The calming psychological effect of peppermint also played a role in reducing the incidence of nausea and vomiting in peppermint group study subjects. This can be seen from the high satisfaction and preference of patients for peppermint aromatherapy and causes patients to be calmer.

The results of this study support several previous studies which showed significant results. Research conducted in Morrow, America, in 2012 proved that peppermint aromatherapy caused a very significant reduction in nausea and vomiting compared to ondansetron and placebo in the second and fifth minute assessments of post-cesarean section patients ($p<0.01$) at each treatment time. This difference in the level of significance may be due to differences in research materials using aromatherapy oil containing peppermint and ethyl alcohol which is thought to have a synergistic effect as an antiemetic, whereas in this study 100% pure peppermint oil was used[16]. Research using pure peppermint has also been carried out and also showed significant results such as in a study conducted in Delaware on post-heart surgery patients[17].

CONCLUSION

Peppermint aromatherapy was better at reducing postoperative laparotomy with general anesthesia than standard intravenous 4 mg of ondansetron therapy, especially in the early minutes after surgery.

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