

Combination Aromatherapy and Acupressure for Treating Nausea and Vomiting

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ABSTRACT

Purpose: To compare the efficacy of aromatherapy infused acupressure wristbands for the prevention and treatment of nausea and vomiting.

Methods: Two hundred ASA I-II, patients undergoing endoscopy procedure were included in a randomized, prospective, double-blind and placebo-controlled study. Patients were divided into four groups of 50. Group I was the control and received no wristband; Group II received an acupressure wristband without aromatherapy at an acupressure point on top of the wrist, which is incorrect placement; Group III acupressure wristband without aromatherapy were applied at the P6 point; Group IV peppermint aromatherapy infused acupressure wristband (NoMo Nausea Band) were placed at the P6 point. Acupressure wristband was placed inappropriately in Group II. The acupressure wristband & combined aromatherapy acupressure wristband were applied 30 minutes prior to induction of anesthesia, and were removed 24 hours post discharge in follow up endoscopy office visit. Patients were asked to smell their wrist if nausea or vomiting ensued. Total intravenous anesthesia (TIVA) was standardized. Results were analyzed by Z test. A P value of < 0.05 was taken as significant.

Results: The incidence of nausea and vomiting in the properly placed aromatherapy and acupressure wristband were significantly lower prior to endoscopic procedure for patients experiencing nausea and vomiting, reducing nausea by 50% and vomiting by 88.8%. Post-operative nausea reduction was achieved when utilizing both aromatherapy and acupressure at a far greater rate than just acupressure alone (59.2% vs. 27%), and reduction of vomiting three times greater than just acupressure alone (90.9% vs. 36.3%). Post discharge nausea and vomiting within twenty-four hours was also significantly reduced when using aromatherapy infused acupressure wristband, and a notable reduction in headache and migraine scores were also seen.

Conclusion: Aromatherapy infused acupressure wristband at P6 causes a greater reduction in pre-operative, post-operative, and twenty-four hours post discharge nausea and vomiting following endoscopic procedures when compared to acupressure at P6 alone. These two complementary therapies are a safe, cost-effective, and efficacious multimodal approach to decreasing nausea and vomiting.

Introduction:

Nausea and vomiting affects over half of our global population each and every day.¹ These two ailments have a variety of etiologies, unsuccessful unimodal treatment options, large economic impact, and negatively affect quality of life. Nausea and/or vomiting are one of the

most common diagnoses for patients visiting a Gastroenterologist undergoing diagnostic endoscopy or colonoscopy. The procedure performed at an endoscopy center is used as a diagnostic measure and not a treatment. For this reason testing the efficacy of complementary therapies like acupressure and

acupressure combined with aromatherapy techniques for the treatment of nausea and vomiting is ideal. Gastrointestinal tract irritation is not the only patient population plagued by nausea and vomiting. A list of the most common causes of nausea can be found in Table 1³, which include but are not limited to, motion sickness, vertigo, psychological (fear, anxiety, pain), headaches, gastrointestinal tract irritation, irritable bowel syndrome (IBS), alcohol (ETOH), drug induced (opioids for pain, steroids, anticonvulsants, and cytotoxins for chemotherapy), and morning sickness in pregnant women. The most common complication for early morning nausea and vomiting during the 6th through the 14th week of gestation is morning sickness. 88% of gravidarum patients experience morning sickness, and 2% suffer from hyperemesis gravidarum, which is a severe form of nausea and vomiting usually requiring medical treatment and hospitalization.^{2,3} Another 53 million people, approximately 20% of the population, suffer from motion sickness. Post-operative nausea and vomiting affects approximately 60-70% of patients undergoing general anesthesia.⁴

Nausea & Vomiting

Nausea is defined as an abdominal discomfort or queasiness, which may or may not be combined with vomiting, the forceful expulsion of stomach contents through the mouth. Nausea is mediated by the autonomic nervous system, while vomiting results from the stimulation of a complex reflex that is coordinated by the vomiting center of the brain. The vomiting center of the brain is located in the dorsolateral reticular formation near the medullary respiratory centers. The vomiting

center receives afferent stimulation from several central neurologic pathways including: chemoreceptor trigger zone (CTZ), cerebral cortex and limbic system in response to sensory stimulations of smell and taste, psychological distress and pain, the vestibular labyrinthine of the inner ear in response to motion, peripheral stimuli from visceral organs, and vascular stimuli via the vagal and spinal sympathetic nerves from exogenous chemicals and endogenous substance formed during inflammation, ischemia, and irritation.¹

Headaches & Migraines

Headaches and migraines are the 19th leading cause of people with disability according to the World Health Organization. Migraines, defined differently than headaches, as a disabling neurological disorder aggravated by accompanying symptomatology like nausea. Migraines are usually accompanied by symptomatic gastro-intestinal symptoms, most commonly nausea and vomiting. 90% of migraine sufferers experienced nausea and almost 70% experienced vomiting according to Silberstein.⁵ Acupressure at P6 has been recently studied as a treatment for migraines, and Allais et al found that there was statistically significant improvement in patients experiencing migraines who underwent acupressure at P6.⁶ Complementary therapies do not require a medical professional and help reduce the symptoms at home where the discomfort starts and can be continued at home after treatment.⁷

Current Therapies for Nausea and Vomiting

Current therapies for the prevention and treatment of nausea and vomiting are classified as antiemetics, specifically medications that

help to decrease nausea and vomiting, have recently been heavily researched and developed. Routine use of these antiemetic drugs is not recommended because of adverse effects. Ondansetron, a 5HT-3 antagonist, is the most expensive and most utilized drug; causes headaches, constipation, cardiac arrhythmias, and birth defects on unborn children. Droperidol, an anti-dopaminergic, can cause agitation, sedation, extra-pyramidal reactions including cervical contortion and uncontrollable movements, and delayed awakening when associated with general anesthesia. Corticosteroids have also been prescribed in severe nausea and vomiting cases, side effects include increased glucose, weight gain, immunosuppression, and teratogenic risk to a fetus in utero.³ Transdermal scopolamine patch, an anticholinergic, blocks the action of acetylcholine (Ach) resulting in dry mouth, constipation, sedation, delayed awakening in over 91% of patients.² Phenothiazines and antihistamines can also be used, but they too cause sedation and lethargy. Metoclopramide, an anti-dopaminergic, reduces gastric emptying time but causes dystonic reactions, restlessness, lactation, and tachycardia.² Due to the potential life threatening side effects of anti-emetic medication, complementary therapies including non-pharmacological techniques have been studied. Multimodal management is needed to control post-operative nausea and vomiting (PONV) and post discharge nausea and vomiting (PDNV).⁸ Winston et al. in 2003 and Pellegrini found that aromatherapy of an alcohol base provided relief 50% more rapidly than Ondansetron or promethazine, and Agarwal et al. found that acupressure at P6 caused a reduction in the incidence of PONV within the first six hours following laparoscopic

cholecystectomy to be similar to that of Ondansetron 4mg as a rescue antiemetic.^{9,8}

Non-pharmacological therapies like aromatherapy of peppermint essential oil and acupressure have been resurfacing for the treatment of nausea and vomiting because of their non-invasive, effective, and no side effect modalities, keeping patient safety at the forefront while driving down costs in ambulatory surgery centers and hospitals. In the United States, it is estimated that the cost of nausea and vomiting for acute medical expenses for stomach infections exceeds \$1 billion per year.¹⁰ These non-pharmacologic modalities assist in the emotional and physical well-being of people and help improve quality of life.⁸

Aromatherapy

Aromatherapy, as a complementary modality, dates back as far as 2800 BC.⁵ Inhaling vapors of essential oils, which cross the blood-brain barrier and alter brain function, defines aromatherapy.¹ Aromatherapy can also be defined as the use of essential oils to promote physical and psychological well-being. The aroma of peppermint oil was chosen for this endoscopy trial because studies show that *Mentha Piperita* is used to reduce colonic spasm during colonoscopies. Peppermint oil, derived from the plant *Mentha Piperita*, is believed to function as a spasmolytic by relaxing the oesophageal sphincter and equalizing the oesophageal and gastric pressures.¹¹ Menthol is the main therapeutic agent within peppermint that acts as an antiemetic. As a primary component, 29-48%, menthol is responsible for the spasmolytic effects of peppermint aromatherapy. Peppermint reduces smooth muscle contractions through blocking the

calcium channels of the smooth muscles of the gut. Menthol also stimulates bile flow, reduces the tone in the esophageal sphincter, and facilitates belching. This mechanism of action has been proven to reduce the nausea and vomiting symptoms of irritable bowel syndrome (IBS) and decrease colonic spasms during endoscopy.¹¹ Besides gastrointestinal problems, peppermint is shown to reduce symptoms of dyspepsia, minor indigestion, and morning sickness. The histaminic, 5-hydroxytryptaminic (5-HT) and cholinergic system effects were proven in the nineties with tests on rabbits and guinea pigs.¹¹ Antispasmodic properties of peppermint help to decrease symptoms of IBS.¹ The results have concluded that peppermint aromatherapy is an inexpensive, safe, and effective therapeutic option for the treatment of chemotherapy induced nausea and vomiting.¹²

Inhaled vapors of peppermint essential oils not only reduced the incidence and severity of nausea and vomiting, but also decreased the antiemetic drug requirements and improved patient satisfaction.¹ Aromatherapy of peppermint has been used to decrease morning sickness in 41% of cases studied. Patients treated with *Mentha Piperita*, peppermint, reduced the median emetic events by half.¹² Pain due to dyspepsia was reduced by 68.7% with peppermint.¹³ A review by Grigoleit and Grigoleit showed that peppermint reduced IBS symptoms by 58% and up to 76%.¹⁵ They also concluded that peppermint is equally efficacious to standard treatment of IBS with anticholinergics. Treatment with peppermint totaled 43% while the drug metoclopramide only treated 13.3%, representing evidence that peppermint acts by speeding the passage of food to a greater extent than metoclopramide.¹³

From the data above, peppermint aromatherapy is advantageous for treatment of nausea and vomiting from IBS, morning sickness, motion sickness, chemotherapy, post-operative anesthesia, dyspepsia, drug induced, alcohol induced, and psychologically induced nausea.

Acupressure

Acupressure has been an integral part in the practice of medicine in China for the last 23 centuries along with other well-known alternative medicine modalities like acupuncture. Acupressure at P6 causes a low frequency electrical stimulation on the skin's sensory receptors activating $\alpha\beta$ and α fibers.² These fibers synapse with the dorsal horn of the central nervous system causing the endorphogenic cells to release endorphins from the hypothalamus.⁸ The release of endorphins from these Serotonergic and Norepinephrinergic fibers provide local inhibition at the CTZ. The CTZ is located in the nucleus tractus solitaries of the postrema of the brainstem. Signals to stop nausea and vomiting are transmitted to the periaqueductal gray area of the midbrain causing enkephalin release. Enkephalin stimulates type I and type II afferent nerves to release monoamine neurotransmitters: serotonin and norepinephrine in the spinal cord.⁸ Both endorphins and adrenocorticotrophic hormone (ACTH) from the pituitary gland are found in the bloodstream and in the cerebral spinal fluid (CSF). Agarwal et al. showed that patients receiving acupressure at P6 had an increase in β endorphins with in the CSF.² This synergistic response from acupressure at P6 and the resulting increase in β endorphins restores the flow of energy and calms the upper gastrointestinal tract. These opposing central dopaminergic receptors from

the CTZ signal local 5-HT chemoreceptor antagonists in the mucosa of the upper gastrointestinal tract to enhance gastric motility and stop the vomiting reflex by the P6 acupressure point.^{2,8,14} Acupuncture can bring about the release of opioid peptides, activate the hypothalamus and pituitary glands, modify blood flow, alter immune function, and affect the secretion of neurotransmitters and neurohormones making it an excellent choice for patients post operatively and during recovery post discharge.¹⁵ P6 acupressure is the non-invasive variation of acupuncture.¹³

The benefit of P6 acupressure for reduction of morning sickness, PONV, chemotherapy induced nausea and vomiting (CINV), and PDNV has been well shown as a treatment option. Of the 161 women studied, 92.5% reported a significant decrease in nausea and vomiting when using acupressure bands.¹⁶ Another 87% obtained relief during their first trimester morning sickness.⁷ Inside of the operating room during caesarean sections, the P6 acupressure point reduced the incidence of nausea and vomiting from 66% to 36% and after surgery from 53% to 23%.² The emetic benefits of acupressure extend far beyond the period at which the P6 point is applied. 90-95% of vomiting chemotherapy patients maintained the antiemetic action for up to 24 hours after the bands were removed.⁴ Of the 104 patients studied, the use of acupressure decreased the after surgery nausea and vomiting by 42%.¹⁸ In a six hour post-operative study, only 10% of patients had PONV in comparison to 8% treated with Ondansetron.² PONV was reduced by 44% in vaginal surgery, and only 19% of patients in the acupressure group had nausea and vomiting within the first 24 hours.²

Patient Satisfaction & Cost Considerations

Aromatherapy and acupressure are gaining popularity as a form of complementary medicine in the Western Culture because of their ease of administration, rapid onset of action, cost effectiveness, and minimal side effects. The Office of Alternative Medicine (ASPAN), within the National Institutes of Health, published a statement affirming the benefits of these two modalities for post-operative and chemotherapy-induced nausea and vomiting. ASPAN ranked P6 acupressure as a Class I, Level A.3, meaning that based on clinical practice guidelines the benefit is greater than the risk and strong evidence supports performing acupressure on patients. P6 acupressure is to be attempted as a first line defense against nausea and vomiting. In 2006, ASPAN also assigned aromatherapy as a Class IIb, Level B which states the benefit is equal to or greater than the risk and it is not unreasonable to perform or administer. In aromatherapy trials with peppermint scent, patients regard the scent as pleasing and comforting.⁸ Winston in 2003 found that inhalation of an alcohol group like menthol was equivalent to Ondansetron 4mg, but patients utilizing aromatherapy achieved results 50% faster.⁸ And according to Roscoe & Matteson, the PACU cost for the IV medicated group was three times that of the acupressure group with the same reduction in PONV. When acupressure was used as an adjunct the need for pharmacologic treatment fell from 47% to 26% following surgery.^{17,18} Physicians and patients alike are welcoming these natural medicinal therapies considering the multifactorial etiology of nausea and vomiting, and the unlikelihood of a single drug or treatment option could counteract all causative factors.

Methods: Following patient informed consent was obtained from all patients included in this study. Two hundred patients of either sex, aged between 18 and 60 years, ASA grade I-II, undergoing endoscopy or colonoscopy for a pre-operative diagnosis of nausea and vomiting were included in this randomized, prospective, double-blind and placebo controlled study. Patients with wrists greater than 6.25” in circumference were randomized into four groups of 50 each using a table of random numbers:

Group I – Control

Group II – Placebo

Group III – Acupressure Only

Group IV – Aromatherapy & Acupressure Wristband

Randomization was conducted by computer and the code was sealed until arrival of the patient in the in pre-operative setting. Patients were told that a form of acupressure (using wristbands) may reduce the incidence of post endoscopic procedure sickness and we were investigating the most appropriate site for this to be placed. Patients were explained that smell on the wrist of the opposite side of the IV may reduce the incidence of sickness and vomiting and were asked to smell their wrist anytime they felt sick.

In Group I, no wristband was placed on the patient. In Group II, the spherical pressure bump of the acupressure wristband was placed inappropriately on the dorsal side of one forearm without the IV 30 minutes prior to induction of anesthesia. In Group III, patients’ acupressure band was applied at the P6 point of one forearm without the IV 30 minutes before the induction of anesthesia. In Group IV, patients’ aromatherapy infused acupressure wristband (NoMo Nausea Band™, Darna & Company LLC US) was placed at the P6 point

of one forearm without the IV 30 minutes before induction of anesthesia. Patients in all groups were told to smell wristband if they felt sick to maintain blinding.

Pre-op was defined as the first encounter with the patient on arrival at the surgical center. Before-op was defined as 30 minutes pre-op and immediately before undergoing endoscopic procedure. Post-op is immediately post procedure within 1 hour. Post- discharge is 24 hours after the patient leaves the surgical center.

The peppermint aromatherapy infused acupressure wristband & acupressure wristband without aromatherapy has a spherical pressure bump within an elastic wristband as one entity (Figure 1). One containing 3% essential oil (NoMo Nausea Band) infused in the elastic wristband while the other has no aromatherapy. The treatment Chinese Meridian point P6, named Nei-Guan point, is used for the treatment of nausea and vomiting. P6 can be located two body inches proximal to the distal crease of the wrist joint, also known as two cun (a cun is a Chinese measurement equal to the width of the interphalangeal joint of the thumb), in between the two tendons of the flexor carpi radialis and palmaris longus (Figure 1).^{2,18} Application at any other location other than P6 will not decrease nausea and vomiting. The acupressure band was placed around the wrist, such that patients felt gentle pressure without discomfort. Correct pressure may correspond with a mild redness at the pressure point location, but adequate perfusion to the hand was tested with a pulse oximetry placement on any distal finger. Patients with wrists only measuring larger than 6.25” were qualified to ensure adequate acupressure and to ensure that the wristbands would not be too loose. Forearms were raised by at least 60 degrees and placed on chest for close proximity to the nose

for aromatherapy to be smelled continuously through the procedure, and to ensure that venous emptying occurred normally in all cases.

Exclusion criteria included patient's refusal to participate in the study, allergy to peppermint essential oil, wrist size less than 6.24" in circumference, diabetes mellitus, peripheral neuropathy, Raynaud's syndrome, upper extremity lymphedema, peripheral vascular disease, any peripheral circulatory disorder, or patients receiving antiemetic medication within 72 hours of endoscopic procedure.

Standard ASA monitors were applied with pulse oximetry on the index finger of the same arm as the wristband. 2 liters of oxygen via a nasal cannula was placed on all patients immediately prior to the procedure. Total intravenous anesthesia was standardized. Anesthesia was induced with Propofol and titrated as need to maintain adequate sedation. Patients remained spontaneously ventilating. The wristband was removed 24 hours postoperatively at the follow up visit in the endoscopy office suite by blinded observer.

Upon arrival to the endoscopy pre-op, blinded observer obtained informed consent and gave sealed envelope with instructions for wristband placement, smelling instructions, nausea and vomiting score sheet with scorings on headaches and migraines, and a wristband. After the IV was placed by a registered nurse in pre-op, blinded observer assisted in the placement of wristband according to instructions on the forearm without the IV. Thirty minutes after the placement of the wristband, patients were sent to the endoscopy suite, and nausea, vomiting, and headache scores were reevaluated immediately prior to the procedure. The incidence of PONV was evaluated within one hour of the patients' arrival to the post anesthesia care unit (PACU), also known as day surgery or phase II at some facilities, and then 24 hours post discharge after

endoscopic procedure at the follow up visit in office the following day on day 2. The results were scored as none, mild nausea, moderate nausea, extreme nausea, vomiting by a numerical scale where 0= none "no nausea", 1= mild nausea "I'm a little nauseous", 2= moderate nausea "I feel very nauseous", 3= severe nausea "I'm so nauseous I think I'm going to throw up", 4= vomiting "I vomited". The results for headaches and migraines were scored as none, mild headache, or severe headache or migraine, by a numerical scale where 0=none "no headache", 1= "mild headache", 2= "severe headache or migraine". If the patient vomited more than twice in PACU they were given 4 mg Ondansetron IV as the rescue antiemetic prior to discharge, but no medication for severe headache or migraine score was given. Patients' characteristics in the four groups were assessed using an unpaired Student's t test. Nausea and Vomiting data was analyzed using a Z test to compare the occurrence in all four groups. Comparisons between groups were performed for overall nausea and vomiting: 30 minutes after band placement, post endoscopy procedure, and 24 hours post discharge. Nausea and vomiting were then compared separately at various levels of severity. A P value of < 0.05 was considered significant.

Table:

FIGURE 1. P6 acupressure point & Latex-Free elastic 3% peppermint essential oil infused acupressure wristband.

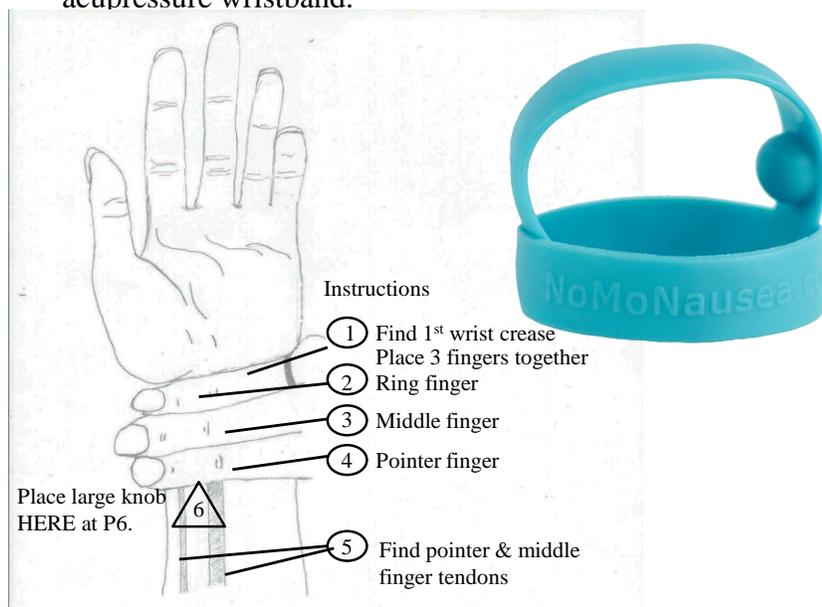


TABLE 1.³ Determining the causes of nausea and vomiting

Common Causes	Clinical Picture	Principle Site of Action
<p>Chemical</p> <ul style="list-style-type: none"> • Drugs (opioids, digoxin, steroids, antibiotics, anticonvulsants, cytotoxins, anesthetic gases) • Biochemical (hypercalcemia, uremia, organ failure) • Toxins (tumor factors, infection, drug metabolites, radiation, ischemic bowel, food poisoning) 	<p>Symptoms of drug toxicity or underlying disease plus nausea as the prominent symptom. Nausea usually not relieved by vomiting.</p>	<p>Chemoreceptor Trigger Zone (CTZ) Dopamine (D₂) Serotonin receptor antagonist (5-HT₃)</p>
<p>Gastrointestinal Tract-Vagal</p> <ul style="list-style-type: none"> • Gastric irritation (Aspirin, NSAIDs, steroids, antibiotics, blood, ETOH, stress, radiotherapy) • Obstruction (partial or complete) • Constipation • Gastric stasis • Mass effect (GI, GU, hepatic distention, carcinomatosis) • Anatomic/Structural 	<p>Epigastric pain, fullness, acid reflux, early satiety, flatulence, hiccup, intermittent nausea relieved with vomiting. Altered bowel habit, pain may occur with oral intake. Vomitus may be large volume and fecal smelling.</p>	<p>Vagal & sympathetic afferent nerve pathways. Dopamine (D₂), Serotonin receptor antagonist (5-HT₃) and 5HT₄ receptors H₂ receptors Acetylcholine</p>
<p>CNS</p> <ul style="list-style-type: none"> • Increased Intracranial Pressure (brain metastases, infectious meningitis, cerebral edema, bleeding) • Psychological (fear, anxiety, pain) 	<p>Headache +/- cranial nerve signs, (diurnal). Vomiting often without nausea.</p> <p>Anticipatory nausea/vomiting to sights, smells, etc.</p>	<p>Histamine (H₁) receptors</p>
<p>Vestibular</p> <ul style="list-style-type: none"> • Motion sickness • Cerebellar tumor 	<p>Nausea +/- vomiting with movement.</p>	<p>Histamine (H₁) receptors Acetylcholine</p>
<p>Hormonal</p> <ul style="list-style-type: none"> • Morning sickness 		<p>Human chorionic gonadotropin (HCG)</p>

TABLE 2. Nausea Level Reporting Pre-op

<i>Group</i>	<i>Mean</i>	<i>Std. Dev.</i>
I	2.667	0.973
II	2.51	1.12
III	2.411	0.942
IV	2.431	1.025

n=50

TABLE 3. Severity of nausea/vomiting pre-op

<i>Groups</i> (<i>n=50</i>)	<i>I</i> (<i>Control</i>)	<i>II</i> (<i>Placebo</i>)	<i>III</i> (<i>Acupressure</i>)	<i>IV (Acupressure</i> & <i>Aromatherapy</i>
<i>Nausea</i>				
None	2	3	2	3
Mild	2	4	4	3
Moderate	17	20	22	21
Severe	19	12	17	15
<i>Vomiting</i>	10	11	5	8

TABLE 4. Severity of nausea/vomiting before-op (30 min after placement) & immediately prior to endoscopy

<i>Groups</i> (<i>n=50</i>)	<i>I</i> (<i>Control</i>)	<i>II</i> (<i>Placebo</i>)	<i>III</i> (<i>Acupressure</i>)	<i>IV (Acupressure</i> & <i>Aromatherapy</i>)	<i>Control vs.</i> <i>acupressure</i> <i>% decrease</i>	<i>Control vs. acupressure</i> + <i>aromatherapy</i> <i>% decrease</i>
<i>Nausea</i>					17.5%	50.0%
None	1	2	11	29		
Mild	3	5	13	12		
Moderate	19	15	9	4		
Severe	18	18	11	4		
<i>Vomiting</i>	9	10	6	1	33.3%	88.8%

TABLE 5. Severity of nausea/vomiting post-op

<i>Groups</i> (<i>n=50</i>)	<i>I</i> (<i>Control</i>)	<i>II</i> (<i>Placebo</i>)	<i>III</i> (<i>Acupressure</i>)	<i>IV</i> (<i>Acupressure</i> & <i>Aromatherapy</i>)	<i>Control vs.</i> <i>acupressure</i> % decrease	<i>Control vs.</i> <i>acupressure +</i> <i>aromatherapy</i> % decrease
<i>Nausea</i>					27.0%	59.2%
None	2	5	16	38		
Mild	4	6	15	6		
Moderate	17	11	6	4		
Severe	16	16	6	1		
<i>Vomiting</i>	11	12	7	1	36.3%	90.9%

TABLE 6. Severity of nausea/vomiting post-discharge within 24 following endoscopic procedure

<i>Groups</i> (<i>n=50</i>)	<i>I</i> (<i>Control</i>)	<i>II</i> (<i>Placebo</i>)	<i>III</i> (<i>Acupressure</i>)	<i>IV</i> (<i>Acupressure</i> & <i>Aromatherapy</i>)	<i>Control vs.</i> <i>acupressure</i> % decrease	<i>Control vs.</i> <i>acupressure +</i> <i>aromatherapy</i> % decrease
<i>Nausea</i>					30.7%	79.5%
None	2	6	19	42		
Mild	4	5	14	4		
Moderate	19	10	7	3		
Severe	16	17	6	1		
<i>Vomiting</i>	9	12	4	0	55.50%	99.40%

TABLE 7. Incidence of nausea/vomiting pre-op, before-op, post-op, & post-discharge endoscopy

<i>Groups</i> (<i>n=50</i>)	<i>nausea</i>				<i>vomiting</i>			
	<i>pre-</i> <i>op</i>	<i>before-</i> <i>op</i>	<i>post-</i> <i>op</i>	<i>post-</i> <i>discharge</i>	<i>pre-</i> <i>op</i>	<i>before-</i> <i>op</i>	<i>post-</i> <i>op</i>	<i>post-</i> <i>discharge</i>
<i>I</i> (<i>Control</i>)	38	40	37	39	0	9	11	9
<i>II</i> (<i>Placebo</i>)	36	38	33	32	11	10	12	12
<i>III</i> (<i>Acupressure</i>)	43	33	27	27	5	6	7	4
<i>IV</i> (<i>Acupressure</i> & <i>Aromatherapy</i>)	39	20	11	8	8	1	1	0

TABLE 8. Severity of headaches pre operatively

<i>Groups</i> (n=50)	<i>I</i> (Control)	<i>II</i> (Placebo)	<i>III</i> (Acupressure)	<i>IV</i> (Acupressure & Aromatherapy)
<i>Headache</i>				
None	43	44	44	42
Mild	2	2	2	3
Severe/Migraine	5	4	4	5

TABLE 9. Severity of headaches post operatively

<i>Groups</i> (n=50)	<i>I</i> (Control)	<i>II</i> (Placebo)	<i>III</i> (Acupressure)	<i>IV</i> (Acupressure & Aromatherapy)	<i>Control vs. acupressure</i> % decrease	<i>Control vs. acupressure + aromatherapy</i> % decrease
<i>Headache</i>					50.0%	66.6%
None	44	45	47	48		
Mild	5	0	2	1		
Severe/Migraine	1	5	1	1		

TABLE 10. Demographic for Group IV

<i>Group</i>	<i>Sex (M/F)</i>	<i>Satisfaction (M/F/Avg.)</i>	<i>Price (M/F/Avg.)</i>
IV	18/32	1.78/1.91/1.86	\$21.67/\$15.45/\$16.98

TABLE 11. Patient Satisfaction Rating Based on Sex

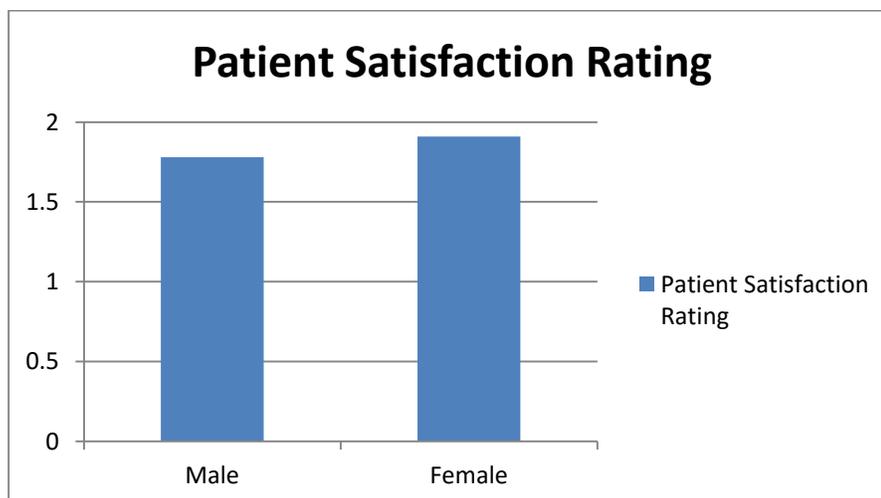


TABLE 12. Number Participants of each sex & how much they would pay

price spend	Male	Female
\$0	0	0
\$10	9	22
\$20	3	7
\$30	2	1
\$40	2	3
\$50	2	0

Results:

Patients were comparable in all four groups with age, weight, sex, and duration of procedure. Among the four groups, pre-operative nausea and vomiting scores were all similar, scoring a mean around 2.5 with a standard deviation around 1 (Table 2). The incidence of pre-procedure, post-operative and post-discharge nausea and vomiting in the control group and the placebo group were essentially the same (Group I versus Group II) as expected (Table 3). The group with acupressure alone (Group III) did experience an improvement in the chance of reporting either mild or no nausea in all 4 measured metrics when compared to placebo (Group II): before-op (28.91% vs. 6.38%) post-op (37.41% vs. 11.75%) and post-discharge (43.42% vs. 12.64%) (Table 4-7). This is consistent with published data comparing placebo to acupressure in improving PONV excluding aromatherapy.

Subsequently, there was a further significant decrease in the chance of reporting either mild or no nausea and vomiting in the group which utilized acupressure and aromatherapy (Group IV) compared to acupressure alone (Group II): before-op (61.08% vs. 28.91%), post-op (74.91% vs. 37.41%) and post-discharge (87.10% vs. 43.42%). In terms of percent reduction of nausea in Group IV versus Group III 30 min after the wristbands were placed in pre-op, before-op (50% vs. 17.5%), post-op (59.2% vs. 27%), and post-discharge (79.5% vs. 30.70%) the aromatherapy infused acupressure band

more than doubles the therapeutic value of acupressure alone (Table 4-7). The greatest reduction was seen in its effects on PDNV, 24 hours after the procedure. Vomiting reduction was attributed the efficacy of the aromatherapy component as seen in Group IV and Group III: before-op (88.8% vs. 33.3%), post-op (90.9% vs. 36.3%), and post-discharge (99.4% vs. 55.5%) (Table 5-7). No significant side effects were observed or reported due to placement of placebo, acupressure alone or acupressure plus aromatherapy wristbands.

Headaches and migraine scores were recorded initially as compounding etiologies of nausea and vomiting. The data showed that both acupressure and aromatherapy and acupressure simultaneously are actually treatments for headaches and migraines, not just the nausea affiliated with the symptoms. The reduction of headaches and migraines in Group IV and Group III respectively when compared with the control were 90% and 50% (Table 8-9).

Patient demographics of Group IV in regards to their sex were graphed along with patient satisfaction scores (Table 11) & price patients would be willing to pay to use this combination therapy again (Table 12). In Table 11 the ratings were from 0 to 2 where 0 means unsatisfied “I would never try peppermint aromatherapy and acupressure again pre-op”, 1 means satisfied “I would use this combination again,” and 2 means very satisfied “I will always try this combination and recommend it to others before surgery.” The price they would be willing to pay for relief using this aromatherapy infused acupressure device was

asked in increments of \$10 from \$0 to \$50 (Table 12). On average, over 93% of patients would try these two complementary therapies again for surgery and would consider this treatment as very satisfactory. Women maintained a higher satisfaction rating compared to men, but men were willing to pay more for the product to use it again.

Discussion:

Endoscopic evaluation is the gold standard in accurately diagnosing causes of nausea and vomiting. The procedures in our study are only diagnostic, hence, post-operative nausea and vomiting remains a hurdle. Patients and consumers are disenchanted with medications and now seek a natural alternative which is proven to work. There are very few commercially available products to fill this void- most of which provide only anecdotal evidence to support their claim to decrease nausea and vomiting. In this study, aromatherapy infused acupressure wristband provides evidence suggesting these two complementary therapies are treatment for nausea and vomiting, anecdotally for headaches and migraines, and the combination far exceeds the medicinal value of acupressure alone.

Aromatherapy and acupressure separately have been shown to be efficacious in decreasing nausea and vomiting as it relates to irritable bowel syndrome, morning sickness, motion sickness, chemotherapy, etc.^{1,11,13,15} In our study, utilizing the combination of aromatherapy and acupressure has not only been proven as a treatment for nausea, vomiting, and headaches (pre-procedure, post-operative and post-discharge), but it is significantly better than current single modality of acupressure.

Even when compared to medicine, aromatherapy by itself was found to provide relief 50% more rapidly than the commonly used medications Ondansetron or Promethazine. Acupressure at P6 alone has been found to provide similar relief in post-

References:

operative nausea and vomiting compared to Ondansetron.^{8,9} The smell of the alcohol base within peppermint aromatherapy acts faster than currently used drugs without dangerous side effects like dystonic reactions, restlessness, tachycardia or cardiac arrhythmias.² When used as an adjunct, acupressure reduces the need for pharmacology treatment in up to 47% of patients because this combination therapy acts as a catalyst with routine pharmacological antiemetic drugs to further decrease nausea and vomiting.¹⁸

Unfortunately, nausea is a common symptom people experience.¹ Even reducing nausea by half increases patient satisfaction in both the pre-operative and post-operative setting. Aromatherapy of peppermint oil and acupressure at P6 achieves over 80% resolution or improvement in nausea and vomiting. Although not a primary focus of our study, it was noted that of the small patient population that reported headaches or migraines, the reduction in their severity was 66.6% on day one and 90% on day two post-procedure with the combined therapy of acupressure and aromatherapy. Further research is needed to investigate headache relief as a new indication for aromatherapy infused acupressure band.

Compared to more expensive medication, the aromatherapy infused acupressure device (NoMo Nausea) is an easy to use, low cost, and devoid of harmful side effect way to better patient satisfaction both in and out of the hospital or procedural suite. The tremendous success outlined in our study proves that peppermint aromatherapy and acupressure at P6 is a safe, ultra effective, fast acting, reliable, and non-drowsy way of alleviating nausea and vomiting while increasing better quality of life naturally.

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