Aromatherapy for Preoperative Anxiety: A Pilot Study

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Purpose: *The aim of this study was to evaluate the use of a lavender aromatherapy skin patch on anxiety and vital sign variability during the preoperative period in female patients scheduled for breast surgery.*
Design: *This observational pilot study used a one-group, pretest and post-test design.*
Methods: *Participants received an aromatherapy patch in addition to standard preoperative care. Anxiety levels were assessed with a 10-cm visual analog scale at baseline and then every 15 minutes after patch placement. Vital sign measurements were recorded at the same interval.*
Findings: *There was a statistically significant decrease (P = .03) in the anxiety visual analog scale measurements from baseline to final scores.*
Conclusions: *Findings from this study suggest the use of aromatherapy is beneficial in reducing anxiety experienced by females undergoing breast surgery. Further research is needed to address the experience of preoperative anxiety, aromatherapy use, and the challenges of managing preoperative anxiety.*

Keywords: *preoperative, anxiety, aromatherapy, complementary therapy.*
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ACUTE ANXIETY IS A FREQUENTLY occurring symptom experienced by patients in almost all health care settings and is associated with numerous poor health outcomes.[1,2] Although there are many classifications of anxiety, acute situational anxiety is a subjective feeling of an unpleasant, fearful emotion or uneasiness that is influenced by an immediate situation such as surgery.[1-4] The intensity and duration of acute situational anxiety can vary among patients, especially those awaiting surgery in the preoperative period.[2] Previous studies estimate that the incidence of preoperative anxiety ranges from 11% to 80% in adult patients.[2,5] Although anxiety is common in the surgical setting, unassessed, untreated, or undertreated preoperative anxiety can lead to numerous deleterious consequences.[1,5-8] Tachycardia, arrhythmias, hypertension, increased levels of pain, difficulty with providing pain management, increased anesthetic requirements, higher incidence of postoperative nausea and vomiting, and longer hospitalization have all been associated with poorly managed anxiety in the preoperative period.[1,5-8]

Major goals of patient-centered, preoperative care are to assess negative biobehavioral changes associated with anxiety and to implement strategies to alleviate those changes.[9] Traditional preoperative anxiety treatment includes medications such

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as midazolam, a benzodiazepine, which has been shown to produce negative physiological effects such as delayed awakening, nausea, and vomiting.[7] Nonpharmacologic interventions such as music, acupuncture, relaxation techniques, and aromatherapy offer a holistic, patient-centered approach, and have been shown to reduce and alleviate anxiety without any negative sequelae.[1,7,10,11] Data continue to emerge to support the practicality and efficacy of these nonpharmacologic strategies to reduce anxiety, specifically aromatherapy, the target of this study.[11]

Aromatherapy is a low-risk complementary therapy that uses natural, plant essences (ie, lavender, spearmint, peppermint, and citrus) for therapeutic purposes.[12,13] Essential oils may provide a calming treatment option with significant psychological and physiological benefits, without the use of artificially created anxiolytic chemicals such as those used in medications.[13,14] Aromatherapy simply begins with the inhalation of aromatic molecules such as lavender essential oil. The aroma can then trigger emotional and physical responses through the olfactory system and almost immediately, the brain.[14] Aromatherapy offers multiple benefits over other complementary therapies such as music, acupuncture, and relaxation techniques as it does not require active patient participation, supplemental equipment, skill set expertise, or additional personnel for implementation.

Aromatherapy is gaining popularity as a complementary therapy to manage anxiety. Over the past decade, a body of evidence has emerged suggesting that aromatherapy positively affects patients in the preoperative setting.[11,15,16] In 2009, Braden et al used an experimental pretest and post-test design to investigate the effect of essential oils on preoperative anxiety. The topical use of the essential oil lavandin was found to lower preoperative anxiety.[15] In 2011, Fayazi et al. conducted a clinical study on the effect of inhalation aromatherapy on preoperative anxiety. A difference in anxiety levels was found between the case group and control group after 20 minutes of inhalation with a handkerchief containing lavandula.[16] In 2013, Ni et al conducted a randomized controlled trial on the anxiolytic effect of aromatherapy. The plant oil bergamot was diffused in

the unit through an ultrasonic aroma diffuser device. A decrease in anxiety scores, heart rate (HR), systolic blood pressure, and diastolic blood pressure was observed in the bergamot essential oil group.[11]

Data from numerous studies suggest that there are gender differences in the presence and severity of anxiety. Female surgical patients experience more preoperative anxiety and report higher levels of anxiety compared with males.[8,17-19] In addition, anxiety has been shown to be higher when facing an oncology procedure.[7] Few studies to date have targeted, specifically, preoperative anxiety in female patients undergoing breast surgery procedures. Thus, methods that are best suited to reduce anxiety in this patient population remain poorly understood.

The aim of this study was to evaluate the use of a lavender aromatherapy skin patch on anxiety and vital sign variability during the preoperative period in female patients scheduled for breast surgery. The study aims were to assess acceptance and to evaluate the use of aromatherapy for anxiety reduction during the treatment period.

Methods

This observational study was conducted in the Ashley River Tower Hospital Surgery Department at the Medical University of South Carolina (MUSC) using a one-group, pretest and post-test design. The Ashley River Tower Surgery Department performs approximately 3,500 breast surgical cases per year. The study was approved by the MUSC Institutional Review Board (Pro00049642) and written informed consent was obtained.

The primary inclusion criterion was female patients scheduled for lumpectomy and/or mastectomy and/or sentinel node biopsy and/or axillary node dissection. Additional criteria included English-speaking and aged 18 years or older. Exclusion criteria included known allergies to lavender and adhesive tape, acute serious medical conditions deeming the surgery an emergency at the time of enrollment, cognitive, mental, or visual impairment such as a diagnosis of blindness, anosmia or dementia per self-report or obtained from the medical record that would prevent

informed consent and self-reporting of anxiety, and asthma or any reactive airway disease diagnosis that could be exacerbated by the aromatherapy.

The protocol included placement of a lavender Bioesse aromatherapy patch by the preoperative Registered Nurse (RN) on the mid-sternal area per manufacturer's recommendation. The RN placed the aromatherapy patch during routine monitor placement for ongoing assessment of vital signs including HR (in beats per minute [bpm]) and mean arterial pressure (MAP in mm Hg).[14] Participants also received standard preoperative care when the patch was in place, which included patient identification with a hospital bracelet, changing into a hospital gown, preoperative vital sign measurement, and the initiation of preoperative order sets.

Demographic data including age, race, ethnicity, marital status, and number of children and clinical characteristics such as diagnosis, surgery type, and surgical history, American Society of Anesthesiologists physical status classification,[20] body mass index (BMI, in kg/m^2), current use of anxiolytic, sedative, and antidepressant medications, and smoking status were collected from the participant and the participant's medical record. Participants' anxiety levels were assessed with a standard 10-cm visual analog scale (VAS) with zero representing no anxiety and 10 representing extreme anxiety. The internal consistency of the VAS has a Cronbach's α range of 0.84 to 0.96 and highly correlates with the State Trait Anxiety Index–State (STAI-S).[21] The VAS was selected over the STAI-S because it allows rapid assessment of the participants' current anxiety levels in the preoperative period compared with the 20 question STAI-S.[21,22] Participants marked their subjective anxiety level on the visual scale at baseline before the patch being placed and then every 15 minutes after patch placement until the time of anesthesia start. Vital sign measurements including HR and MAP were monitored and recorded at the same 15-minute intervals. Anesthesia start was defined as arrival of the anesthesia provider including a Certified Registered Nurse Anesthetist, anesthesia resident, or anesthesiologist at the bedside for transfer to the operating room or administration of an anxiolytic or regional anesthetic. The

aromatherapy patch was removed from the participants' chest at the time of anesthesia start in the preoperative holding area because of the mid-sternal patch location and surgical area.

Study data were entered into Research Electronic Data Capture (REDCap)[23] and analyzed using statistical software SPSS[24] version 23. The study sample was characterized using descriptive statistical analyses for demographic and clinical factors. Baseline and final measurements of VAS and vital sign measurements were reported as means and standard deviations with 95% confidence intervals. Paired sample t tests were conducted to compare the differences between the means of baseline and final VAS and vital sign measurements during the participants preoperative experience.

Results

Of the 34 participants approached, a convenience sample of 30 was enrolled and completed the study. The mean age of the participants was 52.3 ± 16.4 years with a range of 18 to 89 years. The mean BMI was 29.1 ± 6.9 kg/m^2. The racial and ethnic enrollment profile was 66.7% White (n = 20), 26.7% Black or African American (n = 8), 6.7% Asian (n = 2), and 96.7% not Hispanic or Latino (n = 29). Diagnoses included 46.7% malignant neoplasm, breast (n = 14), 3.3% benign neoplasm, breast (n = 1), and 50% other (n = 15). Thirteen participants (43%) had active prescriptions for an anxiolytic, sedative, or antidepressant before their admission for surgery. Participant American Society of Anesthesiologists physical status classification and additional demographic data are presented in Table 1.

The average amount of time that the lavender aromatherapy patch was worn by participants was 58.1 ± 31.4 minutes. Mean baseline, final, and change in VAS and vital sign measurements with their means, standard deviations, and 95% confidence intervals are presented in Table 2. There was a statistically significant decrease in the anxiety VAS measurements from baseline to final scores (mean = 5.7 cm, SD = 2.6 cm; mean = 4.2 cm, SD = 3.3 cm, respectively, P = .03). No significant change in vital sign measurements from baseline to final was observed (Table 2).

Table 1. Demographics of Participants

Participant Characteristics (N = 30)	Mean +/− SD
Age (y)	52.3 ± 16.4
BMI (kg/m^2)	29.1 ± 6.9
Race	Percent (%)
White (n = 20)	66.7
Black or African American (n = 8)	26.7
Asian (n = 2)	6.7
Ethnicity	
Not Hispanic or Latino (n = 29)	96.7
Hispanic or Latino (n = 1)	3.3
Diagnosis	
Malignant neoplasm, breast (n = 14)	46.7
Benign neoplasm, breast (n = 1)	3.3
Other (n = 15)	50
Marital status	
Married (n = 17)	56.7
Not married (n = 8)	26.7
Divorced (n = 5)	16.7
Number of children	
0-2 (n = 21)	69.9
3-4 (n = 8)	26.7
>5 (n = 1)	3.3
ASA physical status classification[20]	
I (n = 2)	6.7
II (n = 21)	70
III (n = 7)	23.3
Smoking status	
Never smoked (n = 20)	66.7
Current smoker (n = 4)	13.3
Quit smoking > 1 y (n = 6)	20

ASA, American Society of Anesthesiologists; BMI, body mass index.

ASA physical status classification: I = healthy patient; II = mild, well-controlled systemic disease; III = severe systemic disease.

Discussion

Findings from this study suggest that the use of aromatherapy is beneficial in reducing anxiety experienced by females undergoing a specific cancer surgery. The mean baseline VAS score of 5.7 cm is consistent with a "clinically meaningful" level of moderately high preoperative anxiety.[22] The significant change in VAS scores from baseline to anesthesia start is consistent with the previous aromatherapy research findings in the preoperative period. In 2009, Braden et al. also found that VAS scores for preoperative anxiety decreased with the use of the essential oil lavandin. The study

investigated 150 adult patients (75 females and 75 males) undergoing gastrointestinal, genitourinary, and orthopaedic procedures.[15] The topical use of the essential oil lavandin was found to be statistically significant in lowering preoperative anxiety ($P = .01$) using a VAS at the time of transfer to the operating room.[15]

Although not statistically significant, the physiological signs of anxiety including HR and MAP measurements showed a slight downward trend indicating improvements from baseline to final measurement. Previous aromatherapy research in the preoperative period by Ni et al found that HR (-6.0 bpm, $P = .015$), systolic blood pressure (-11.0 mm Hg, $P < .001$), and diastolic blood pressure (-5.0 mm Hg, $P = .012$) were significantly decreased among 109 patients awaiting ambulatory surgery in the aromatherapy group.[11] Only the change in VAS and physiological variables from baseline to anesthesia start were analyzed because of the wide variability in aromatherapy patch times and preoperative times among participants. A future randomized controlled trial with a larger sample size will allow for further analysis of changes in VAS and physiological variables throughout the patch and preoperative times.

In an effort to maximize the total aromatherapy patch time for each participant, the preoperative RNs were diligent in placing the patch as soon as reasonably possible. The providers, preoperative RNs, and surgeons, actively supported the study procedures and were instrumental to the success of this study. The aromatherapy patch mode of delivery is consistent and holds better promise compared with past delivery modalities of diffusers, handkerchief doused with an essential oil, or topical application both for ease of use and likelihood of adoption.[11,15,16] Total patch time varied considerable for each participant. Participants wore the patch from 26.7 to 89.5 minutes. This difference may have contributed to a less than optimal reduction in anxiety and physiological variables for some of the participants. Numerous participants gave positive comments during and after the study such as "*a welcomed distraction*;" "*very impressed*;" "*I liked having the option*;" "*very relaxing*;" "*enjoyed the scent*;" "*soothing*;" "*I believe in lavender*;" and "*the doctor loved it as well.*" In addition, one of the surgeon providers commented that they

Table 2. Comparison Using Paired Samples Test for Baseline and Final VAS, HR, and MAP Measurements

Measurements	Baseline	Final	Change	
	Mean +/− SD (95% CI)	Mean +/− SD (95% CI)	Mean +/− SD (95% CI)	*P* Value (*t*[*df*])
VAS (cm)	5.7 ± 2.6 (4.7; 6.6)	4.2 ± 3.3 (3.0; 5.5)	1.4 ± 3.4 (0.15; 2.7)	.030 (2.3[29])
HR (bpm)	76.1 ± 12.9 (71.3; 80.9)	76.0 ± 12.0 (71.4; 80.4)	0.17 ± 9.2 (−3.3; 3.6)	.922 (0.1[29])
MAP (mm Hg)	87.1 ± 13.7 (82.0; 92.2)	84.5 ± 12.3 (79.9; 89.1)	2.6 ± 9.2 (−0.85; 6.0)	.134 (1.5[29])

CI, confidence interval; HR, heart rate; MAP, mean arterial pressure; VAS, visual analog scale.

"would be happy to offer this to all of their patients." Although not directly assessed, this study appears to have had a positive effect on the participants' perioperative experience.

Demographic data demonstrated that a racially diverse sample of females from late teens to octogenarians agreed to use aromatherapy to reduce preoperative anxiety. Most participants had a malignant diagnosis, which could have produced higher baseline anxiety scores and physiological measurements. The mean BMI in this study indicated an overweight patient population.[25] This study was not powered to analyze by age, diagnosis, or BMI, but these factors will be considered in future studies. Obese individuals are at an increased risk for a number of diseases and health conditions, which include breast cancer and mental illness such as depression and anxiety.[25-28] To better understand the association among age, a cancer diagnosis, obesity, and acute preoperative anxiety further research is needed.

A number of limitations were noted in this pilot study. The convenience sample, small sample size, and use of only one preoperative site limit the ability to generalize the findings. A larger sample study with differing populations or preoperative locations (ie, outpatient, general surgery) is needed. In addition, the inability to standardize preoperative times and patch time application, the inability to control the scheduled timing of surgery, and the differences in preoperative bay assignment may have created different preoperative experiences among participants. Lavender was the only scent used for this study, which may not appeal to all participants. Having additional aromatherapy patch scents available is an important consideration for future research.

Despite these limitations and considerations, this study supports that a sustained-release aromatherapy patch was a well received and potentially efficacious intervention to reduce preoperative anxiety in female patients undergoing breast surgery. Aromatherapy may have improved their preoperative experience.

Aromatherapy, along with other complementary and alternative medicine techniques, expands the art of anesthesia. Acute situational anxiety in the preoperative period needs to be assessed and treated just as comorbidities, physiological variables, and pain are assessed and treated. Patient-centered care, both physically and emotionally, should include an armamentarium of skills, techniques, medications, and therapies that are evidence based. Offering aromatherapy, guided mediation, and deep breathing exercises in addition to standard care has had a positive impact on preoperative anxiety and patient satisfaction.

Conclusions

This pilot study has provided the first step toward understanding the role and impact of aromatherapy on preoperative anxiety reduction. Further research is needed to address the experience of preoperative anxiety and the challenges of managing preoperative anxiety. Detecting statistically significant differences in these outcomes necessitates a larger sample size with adequate power. An interdisciplinary team of nurses, anesthesia providers, and surgeons is well positioned to continue work in this area including a future randomized controlled trial to determine the effect of a sustained-release aromatherapy patch on preoperative anxiety.

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