

The Effect of Aromatherapy with Lavender Essential Oil on Anxiety and Stress in Patients Undergoing Coronary Artery Bypass Graft Surgery

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Abstract

Background: Depression and anxiety are among the most common mental disorders before and after surgery. Aromatherapy is a treatment that has grown substantially in recent years in comparison with other complementary and alternative medicines (CAM) to relieve anxiety.

Objectives: This study investigated the effect of inhaling lavender essence on the physiological and psychological status of patients who are candidates for coronary artery bypass graft (CABG) surgery.

Methods: This randomized clinical trial was performed on 60 patients who were undergoing CABG surgery at the hospitals of Artesh Jomhory Eslami (AJA) University of Medical Sciences in Iran. Patients who met specific inclusion criteria were selected and randomly allocated into two groups: a control group that inhaled room air and an experimental group that inhaled from a piece of cotton impregnated with two drops of lavender essence. This intervention was done on the morning of surgery. To evaluate these measures, a Depression Anxiety Stress Scale (DASS) questionnaire was filled out by the patient before and after the intervention. The data collected were analyzed using descriptive and analytic statistics.

Results: After the intervention, the study results showed statistically significant differences between the two study groups in heart rate (mean = 78.83, P = 0.02) and anxiety level (mean = 6.63, P = 0.02). However, the differences between the two groups were not significant regarding stress level (mean = 8.63, P = 0.55) and other physiological variables.

Conclusions: Inhalation aromatherapy is an effective method for reducing the heart rate and the level of anxiety in patients before CABG surgery. Given that the physiological and psychological health of patients are important responsibilities for nurses, aromatherapy can be considered a safe and effective relaxation method before invasive interventions. Learning this method is recommended for students and nurses.

Keywords: Aromatherapy, Anxiety, CABG, Stress

1. Background

Coronary artery disease is the most common type of cardiovascular disease, and the most significant cause of hospitalization and death in the world (1). Cardiovascular disease (CVD) currently accounts for nearly half of non-communicable diseases (2). This disease has increased in Iran (2). Coronary artery bypass grafting (CABG) is one treatment for Coronary Heart Disease (CHD). During CABG, a healthy artery or vein from the body is connected, or grafted, to the blocked coronary artery (3).

Depression and anxiety are among the most common mental disorders before and after surgeries such as CABG

(4). Factors that may increase anxiety in patients include pain, sleep disruption, absence from home and work, long-term treatment, etc. (5).

Anxiety is linked to negative health outcomes (6) such as increased cardiovascular reactions, myocardial oxygen consumption, plasma levels of epinephrine and norepinephrine (7), and the need for analgesics and anesthetics (6, 8). Anxiety can also decrease the ability to resist infection and delay healing of wounds (8). Therefore, patients with increased anxiety levels before undergoing CABG surgery have poorer outcomes than patients who entered surgery with lower anxiety levels (9).

In addition, these patients experience high levels of

stress. Stress can cause tachypnea, hypothermia, increased blood pressure, arterial vasoconstriction, decreased tissue perfusion, and increased duration of hospitalization (10).

Since improvement of the physiological and psychological health of patients is a major goal in nursing (11), strategies such as complementary and alternative medicine (CAM) have been developed and employed for alleviating anxiety and stress. These strategies are safer than pharmacologic therapies (5).

Aromatherapy, the use of essential oils for expected outcomes, is a CAM therapy that has grown substantially in recent years in comparison with other CAM therapies to relieve anxiety (5, 12). This treatment is widely used in nursing and clinical practice (5). Essential oils are steam distillates obtained from aromatic plants (13). Lavender is one of the most widely used aromatic plants in this regard (14). The scientific name of this herb is *Lavandula Spica L.*, and it contains linalyl acetate (15). The benefits of lavender oil are antibacterial, antifungal, carminative (smooth muscle relaxant), sedative, and antidepressive (16). Lavender oil also reduces anxiety, regulates sleep, decreases headaches and migraines, and calms the heart beat (17). This herb improves heart function and stimulates blood circulation and mental relaxation (18).

Research conducted on the physiological and psychological effects of aromatherapy has been contradictory (12, 19). For example, Tayebi et al. found that aromatherapy with lavender was effective on stress in hemodialysis patients (12). But Muzzarelli et al. showed that aromatherapy with lavender had no effect on reducing anxiety in patients before colonoscopy (20). There have also been conflicting results in relation to physiological criteria. For example, in studies by Hwang et al. and Saeki, aromatherapy was effective in decreasing blood pressure (21, 22). But in a study by Shiina and Bikmoradi, aromatherapy had no effect on vital signs (10, 23).

2. Objectives

Due to the aforementioned contradictions about the benefits of this approach, this study was conducted to investigate the effect of aromatherapy with lavender essential oil on anxiety and stress of patients undergoing coronary artery bypass graft surgery.

3. Methods

In a randomized clinical trial from April to October 2013, 60 patients who were candidate for CABG surgery were selected at three educational hospitals of AJA University of Medical Science in Tehran. Considering type I error

(α : 0.5), power (β : 0.15), and estimated error (d: 7), the minimum number of subjects in each group was estimated to be 26 patients. However, to increase the study accuracy, each group included at least 30 subjects.

For inclusion in the study, patients had to meet the following criteria: they had to be between 40 and 80 years old; they had to be literate: they could not have a history of mental illness, and they had to be aware of time, place and people; this had to be their first experience of CABG surgery; they could not be addicted to smoking or drugs; they could not have an olfactory dysfunction; they could have no history of thyroid disease or epilepsy or the use of drugs for these conditions; they could not be on mechanical ventilation at the time of the intervention, nor could they have asthma or other breathing problems; they could have no history of plant allergies; they had to be willing to smell lavender oil essence; and they had to be willing to participate in the study. Hemodynamic instability and dissuade patients remaining for the study were considered exclusion criteria. The patients were then divided into two groups, a control group and a test group, by a simple random selection.

This research was approved by the ethical committee in the research department of AJA University of Medical Sciences, and researchers promised to observe the stated ethical considerations in the Declaration of Helsinki. The following ethical considerations were used in this research: informed consent, protection of anonymity, confidentiality of the information, the subject's right of refusal to participate in the research, and respect for the rights of the authors.

The tool used in the study was composed of three parts. The first part was the patients' demographic information form, and the second part was a form to record the patient's vital signs (blood pressure, pulse, respiration). The third section was the DASS self-report questionnaire (DASS-21). The questionnaire consisted of 21 questions, with seven questions used to measure each of the three symptoms of stress, anxiety, and depression. Scores of 0-4, 5-11, and 12-21 indicated normal condition, moderate disorder, and severe disorder, respectively. In this instrument, the subscale of anxiety measured features such as autonomic arousal, situational anxiety, and musculoskeletal impact. The subscale of stress measured characteristics such as difficulty in relaxation and nervous arousal (For example, it is difficult for me to get relaxed). The depression subscale measured items such as hopelessness, lack of motivation, low self-esteem, and blame (23). Various studies have confirmed the validity and reliability of this questionnaire (10, 12, 24-26).

On the evening before the surgery, the researcher recorded the patient demographic information and physi-

ological parameters (respiration, blood pressure and heart rate). The researcher assessed the respiration of the patients in one up-and-down movement of the chest, which was counted as a single respiration. The heart rate was measured by counting the radial arterial pulse. Both respiration and heart rate were assessed for one minute. Blood pressure (systolic and diastolic) was assessed by use of a sphygmomanometer (calibrated by the standards of the manufacturer) with a stethoscope. Additionally, the DASS questionnaire was provided for the patients to fill out. On the morning of surgery, two drops of lavender essential oil (100%) was poured on a piece of cotton placed in a small container (10 mL), and the container was given to the patients in the test group. They were asked to inhale it for 20 minutes from a distance of 5 cm from their nose. Five minutes after the end of intervention, the DASS questionnaire was completed again by the patients, and their vital signs were recorded by the researcher. No special intervention was done for the control group patients, who inhaled room air. Although in the control groups, if necessary, essential to any effective intervention, patients were excluded from the study. Data collection for this group was also done once on the evening before surgery and once on the morning of surgery. Finally, data collected from the patients in both groups before and after the intervention were compared.

3.1. Data Analysis

In this study, data from the study were analyzed by SPSS software version 17 using descriptive (to describe the variables) and analytic (to analyze the relationships between variables) statistics.

The t-test was used to compare demographic variables (age, weight, body mass index) between the experimental and control groups. The chi-square test was used for comparison of demographic variables (occupation, gender, education level, marital status, surgery experience). The Student's t-test was used to compare the main variables (physiological and psychological criteria) between the two groups before and after intervention (separately). Also, the P value < 0.05 was considered significant.

4. Results

The majority of patients (73.35%) were male. Most of them (95%) were married, 43.35% were ages 60 - 69 years and 53.35% were retired. Regarding the level of education among study participants, most (35.35%) were high school graduates. In addition, 73.3% of the patients had previously undergone surgery. The result of the chi-square test and the t-test showed that the two groups had no significant differences in terms of demographic characteristics ($P > 0.05$).

The main variables in our study were physiological (pulse, respiration, diastolic and systolic blood pressure) and psychological parameters (stress and anxiety). The results of the independent t test suggested no significant difference between the mean physiological and psychological variables of the two groups in the pre-intervention phase (Table 1), which indicates the homogeneity of the two groups before the intervention.

After the intervention, the independent t-test demonstrated a significant difference between the two groups regarding heart rate and anxiety levels ($P = 0.02$) (Table 2). This confirmed the effect of inhalation of lavender essential oil in reducing the heart rate and level of anxiety.

In the present study, there were no statistically significant differences in terms of stress or other physiological variables between the two groups (Table 2). After aromatherapy, the mean of the variables of respiration, diastolic and systolic blood pressure, and stress decreased, but these changes did not reach a statistically significant level.

5. Discussion

The purpose of this study was to investigate the effect of inhaling lavender essence on physiological and psychological measures of the patients who were candidates for CABG surgery. Before the intervention, the data showed no significant differences between the two groups in terms of demographic variables, physiological variables, or levels of anxiety and stress. With respect to this issue, the resulted finding can be attributed to the effect of the intervention with more confidence, and accordingly, the obtained results can be also generalized more confidently. But after the intervention, the results demonstrated that aromatherapy statistically reduced the heart rate and anxiety levels of the patients undergoing CABG surgery.

The results showed that patients in the experimental group had lower anxiety levels than the control group after the intervention. Regarding this finding, several other studies have established the positive impact of lavender oil essence on the level of anxiety (19, 27-30), and these results are consistent with our study. However, a few studies have not demonstrated the same effect (31). For example, in a study by Muzzareli et al., the patient in the intervention group preoperatively received diluted lavender oil essence for five minutes, while the control group received a placebo oil. There was no statistically significant difference between two groups after intervention (20). The reason for the inconsistency of this study with our study was presumably due to the short period of inhalation of the oil essence, the non-use of 100% oil, and differences in the studied examples. Also, Seifi et al. reported that inhalation aromatherapy with lavender essential oil had no effect

Table 1. Physiological Criteria, Stress, and Anxiety of Two Groups in the Pre-intervention Phase

	Respiration	Pulse	Diastole	Systole	Stress	Anxiety
M (SD)						
Intervention^a	19.03 (1.56)	81.26 (8.41)	78.43 (8.19)	126.73 (15.66)	9.10 (4.25)	6.80 (3.84)
Control^b	19.10 (2.20)	83.46 (11.51)	76.56 (8.45)	125.90 (15.03)	7.90 (4.15)	7.23 (2.93)
T-test	0.30	0.89	0.38	0.83	0.27	0.62

^aIntervention group.^bControl group.**Table 2.** Physiological Criteria, Stress, and Anxiety of Two Groups in Intervention Phase

	Respiration	Pulse	Diastole	Systole	Stress	Anxiety
M (SD)						
Intervention^a	19.83 (2.80)	78.83 (9.23)	77.06 (7.67)	126.96 (18.15)	8.63 (4.16)	6.63 (3.95)
Control^b	19.30 (2.40)	84.63 (10.41)	76.80 (10.65)	127.20 (21.56)	9.30 (4.59)	9.13 (4.55)
T-test	0.43	0.02	0.91	0.96	0.55	0.02

^aIntervention group.^bControl group.

on anxiety in patients before coronary artery bypass graft surgery. However, their anxiety decreased significantly after the intervention, although no statistically significant difference was observed between the two groups. One possible reason for this is the pain after surgery. Fear and anxiety about one's future health status may remain after surgery and may affect the patient's mental health status (5).

In this study, inhaling the lavender oil essence had no effect on the stress levels of the patients. This finding is consistent with the results of Cooke et al. (30). They evaluated the effects of three simultaneous interventions (music, massage of extremities, and inhalation aromatherapy) on the stress levels of nurses in an emergency ward over a period of 12 weeks. After three weeks, there was no significant difference in stress levels between pre-and post-intervention phases. But the researcher stated that emergency ward nurses experience high levels of occupational stress, and therefore, such interventions could not reduce their stress levels. Unlike our results, Motomura, Sakur, and Yotsuya showed that Lavender oil essence had a positive effect on stress levels (23). In their study, 42 students were treated under three different conditions (mental stress conditions; mental stress conditions while receiving lavender incense for 20 minutes; and no mental stress conditions). After the end of intervention, there were significant differences in the stress scores of the students. The scores in the three conditions were 8.9, 0.4 and 0.2, respectively. Kim et al. reported that inhalation of an essential oil

had immediate and continuous effects on the base systolic blood pressure, daytime blood pressure, and stress reduction (24).

Regarding the variable of pulse, a significant difference was reported between the two groups after the intervention. In connection with this finding, our results were consistent with the results of Tahmasbi, et al (25). In their study, candidate patients for coronary angiography smelled two drops of lavender essential oil for three minutes. Thirty minutes later, they had a significantly lower heart rate compared with the control group. In the Kim and Kwon (26) study, students who used a combination incense of lavender, orange and chamomile before intravenous injection had lower heart rate compared to controls.

In the present study, inhaling of lavender oil essence had no effect on other physiological variables (respiratory rate, systolic and diastolic blood pressure). However, the Hu et al. study on "the effects of aromatherapy in reducing anxiety physiological parameters during colonoscopy" showed that systolic blood pressure significantly decreased after intervention (19). Tahmasebi et al. showed a significant difference between the group receiving lavender essential oil and the control group in terms of these variables (23). The larger sample size (91 vs. 60) in their study and different types of medical procedures (Angiography vs. CABG) can be the reason for the differences. However, the results of our study are consistent with the Motomura, Sakur & Yotsuya (32) study, which showed

there was no statistically significant difference in systolic blood pressure levels among students in psychologically stressful conditions receiving the lavender incense and not receiving the lavender incense. Also, in the study by Ki-Wol & Myung-Hee (14), which evaluated the effect of aroma on patients' anxiety before colonoscopy, as well as the Oh et al. study (33) that assessed the effect of inhalation of a lavender and orange combination scent on the anxiety of women with bladder cancer, aromatherapy had no effect on the diastolic blood pressure of the patients.

5.1. Conclusions

Given that the patients waiting for CABG surgery experience high levels of anxiety and stress, which can have harmful effects on their health status, we tried in this study to show the effect of aromatherapy on anxiety levels in these patients. The results showed that 20 minutes of inhaling 100% lavender essential oil led to decreased heart rate and anxiety levels for patients before CABG. However, this intervention had no effect on the patients' stress levels or other physiological variables (blood pressure, respiratory rate). It should be noted that the variables of stress and anxiety are very complex phenomena, which vary in different environmental and time conditions. Physiological reactions subsequent to stress vary significantly in different people, and the research on this issue is limited. Since the control group in this study received no intervention, it is recommended that a placebo be used in future studies.

Inhalation aromatherapy is an effective method for reducing the level of anxiety and the heart rate in candidate patients for CABG surgery. With regard to autonomy of nurses in providing palliative care and the promotion of physiological and psychological health of patients, aromatherapy can be considered as an effective and safe method before surgery and other painful or invasive procedures. Since this method is easy and non-pharmacological, students and nurses should learn how to use it.

This study can be used as a basis for future research. Since the placebo was not used for the control group, it is recommended that it be used in future studies. In this study we assessed only the effect of aromatherapy; therefore, in future studies, an evaluation of the effect of aromatherapy on the surgical outcome, length of hospital stay, and timing of extubation of the tracheal tube is recommended.

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Footnotes

Authors' Contribution: Nahid Rajai: study design, data collection, drafting manuscript, final approval of the version to be published, and supervision; Seyedeh Azam Sajadi: substantial contributions to conception and design; acquisition of data or analysis and interpretation of data; drafting the article or revising it critically for important intellectual content; Fatemeh Teymouri: administrative/technical/material support and final approval of the version to be published; Armin Zareiyan: study design, analysis, and interpretation of data; final approval of the version to be published; and supervision; Saeed Siavoshi and Mahdi Malmir: data collection, technical/material support, drafting the article.

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