

Brief Report

The effectiveness of lavender essence on sternotomy related pain intensity after coronary artery bypass grafting

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Abstract

Background: Considering the side effects of pharmacological methods, there has been a suggestion to use nonpharmacological methods such Aromatherapy following coronary artery bypass grafting (CABG). This study aims to evaluate the effectiveness of lavender 2% aromatherapy on sternotomy pain intensity after coronary artery bypass graft surgery in patients who have undergone surgery.

Materials and Methods: During this clinical trial, 50 patients who were candidates for CABG, were randomly divided into two equal groups, that is, the control group ($n = 25$) and the case group ($n = 25$). Following CABG, the case group received two drops of 2% lavender oil every 15 minutes with supplemental oxygen and the control group received only supplemental oxygen through a face mask. The data collection tools comprised of the demographic check list and visual analog scale (VAS) for evaluating the pain intensity. The pain intensity were assessed pre- and five, 30, and 60 minutes post aromatherapy. The final data were analyzed by the *t*-test and chi-squared test.

Results: The findings showed that the pain perception intensity in the case group was lower than that in the control group at the 30- and 60-minute phases after intervention ($P < 0.0001$).

Conclusion: The result indicated that aromatherapy can be used as a complementary method in postoperative pain reduction, as it reduced pain. The patients require two sedative drugs, and moreover, it avoids expenses of treatment.

Key Words: Aromatherapy, complementary medicine, Coronary artery bypass graft (CABG), lavender essence

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INTRODUCTION

In the last two decades, artery bypass disease has been the most prevalent heart disorder that has been sweeping over developing countries over time.^[1] The mortality rate due to the disease is 28.5% in developing countries and 40% in Iran. As a result, 120 to 140 thousand Iranians die because of the disease.^[2] At present, coronary-artery disease is the first cause of mortality in Iranians over 35 years of age.^[2] Coronary artery bypass grafting (CABG) has been the most

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common heart surgery in the last two decades. This surgery is performed to relieve angina pain and keep the heart muscle functioning.^[3] One of the most widespread side effects of CABG includes chest pain in the sternum area. It seems that tearing neural cables in the oscar area results in foregoing chest pain. The incision-related pain of CABG maximizes 24-72 hours after surgery.^[4] Studies report that about 75% of the patients suffer from pain and complain frequently about pain in the chest area during hospitalization in the Coronary Care Unit (CCU).^[5] Inadequate pain relief leads to sympathetic stimulation that in turn leads to problems such as tachycardia, hypertension, arthrid restrictons, increased catabolism, agitation, impairs immunological recovery, and activation of platelets. The negative outcomes may increase the risk of cardiac ischemia after surgery.^[6] As unrelieved acute pain leads to physiological and psychological outcomes, controlling pain after the surgery is one of the most challenging factors for nurses to deal with through pharmacological or non-pharmacological methods.^[7]

Alternative and complementary approaches for pain reduction include a variety of techniques, which besides reducing the pain, have an impact on psychologically related distress.^[8] At present, administration of systemic opioids or non-steroid anti-inflammatory drugs (NSAIDS) is common in CCU wards among these patients, which show some uncalled side-effects such as breathing depression, nausea, vomiting, scratching, retention of urine, decreased blood pressure, oversedation, and in some cases, postponement of extubation of the splint pipe.^[6,8] On account of the cost and side-effects of opioids, using some alternative and complementary methods along with pain killers may decrease the pain, distress, and related side-effects.^[9] Using alternative and complementary methods of pain management are regarded as having a low risk, being economical and easy-to-use, with fewer side effects, and furthermore, are reported to be more tolerable by patients.^[10,11]

One of the alternative painkiller techniques is known as Aromatherapy. Executing the technique is much cheaper in comparison to other non-medical methods, such as, acupuncture, pressure therapy, and hypnotism, and also, it does not need any specialist.^[12,13] This is the second most frequently used complementary bedside therapy for pain reduction. The State Board of American Nurses has introduced the therapy as a component of holistic nursing.^[14,15] Aromatherapy consists of the controlled administration of aromatic oils to maintain and enhance physical and mental health. It can be used by inhaling, compressing, bathing or massaging.^[16]

Lavender, a volatile aromatic oil that is prevalent and precious, has been used for a long time in traditional medicine. The essence of Lavender is obtained through distilling after boiling flowered twigs and leaves. The pharmacological uses of Lavender include its use as a painkiller, for sedation, as a narcotic, anti-inflammatory, and anti-depressive agent, for heart strengthening, stimulating blood circulation, and for healing burns and insect bites. The plant is used for its aroma in cosmetic products.^[17-19]

The action mechanism of Aromatherapy on pain is not clear yet. Probably the aroma has some effects like those of benzodiazepines, which increase the gamma amniotic effects that in turn generate some sedative and tranquilizing outcomes.^[20] The oil essence is absorbed by inhaling, which could affect some enzymes and ionic channels, with multiple gamma amino butyric effects that end in brain stimulation, anxiety decrement, anti-depressive effects, and increased blood circulation in the brain. The oils could pass the blood-brain barrier and interact with the central nervous system receptors.^[18] Research on the effects of aromatherapy on patients' pain has reported contradictory results. Sobhani and colleagues (2010) reported that the linalyl acetate, a component of Lavender, decreased the administered levels of painkillers.^[12] Alavi and others (2010) also proposed that Lavender prevented an increase in the levels of perceived pain during first-time deliveries in women.^[21] On the other hand, Kim and colleagues reported that Lavender had no impact on the perceived levels of pain after breast biopsy surgery and the experimental group only had a more perceived control over pain.^[22]

Bearing in mind the importance of reduction in pain after the operation phase, paying due attention to the complementary herbal therapies and the novelty of the issue is warranted. There is lack of research on the effect of Lavender on the pain severity after sternotomy, the side effects of pain on the recovery process, and also on the nursing roles with use of the complementary therapy. This kind of therapy represents the art of nursing, which along with science, could provide better and more efficient healthcare. With regard to the aforesaid implications, the researcher decided to conduct an intervention, to assess the effects of Lavender essence on pain severity related to a CABG operation and try to increase the patient's satisfaction and decrease the hospitalization period.

MATERIAL AND METHODS

This inquiry is a mono-blinded clinical trial, done after approval of the Ethics Committee of the Mazandaran

Medical Science University and registration in the Iranian Clinical Studies center.

Sampling

The current study includes 50 patients, who underwent open-heart surgery in the Fatemeh-Zahra Hospital of Sari-Iran. According to similar studies reported, $\alpha = 0.5$, $\beta = 0.1$, and the sample volume was estimated to be around 25 people.^[23] The inclusion criteria included: Willingness to participate in the study, being non-addicted, fully aware expiry 24 hours after the surgery, not allergic to lavender or other plants, and first experience of heart surgery. Exclusion criteria included, using tranquilizers and narcotics four hours before the intervention, having some disorder in the olfactory and vision systems, a history of asthma and respiratory disease, a history of psychiatric disorders, intubation period more than 24 hours, and unwillingness to participate.

Tools

The visual analog scale (VAS) was used for evaluating the intensity of pain. The VAS is the most widely administered tool worldwide to evaluate pain intensity. The tool is of 10 cm (0-10) length, and represents the severity of pain.^[24] Evaluation is determined from five time frames:

1. The medical and demographic characteristics (age, gender, education, marital status, diabetic history, duration, etc.) were obtained via interview just before the surgery.
2. Administration of VAS before intervention.
3. Administration of VAS five minutes after intervention.
4. Administration of VAS 30 minutes after intervention.
5. Administration of VAS 60 minutes after intervention.

Process of data collection

First we got the surgery list of the day and also the waiting lists from the Heart Surgery Unit and selected the samples through purposive sampling. We explained the research and process to the patients. Then, using the Rand function of random numbers, we divided the patients into two groups — the experimental and control groups — randomly. Before beginning the procedure, some explanation about how to use the VAS of pain was presented and pain severity of the patients was rated. Two days after the operation, in the late hours of the evening working shifts, after four hours or more had passed from the last dose of painkillers, the researcher met the patients. We chose this time because it was adjacent to the sleep time and this time was approximately a low-traffic period of medical care. Selecting a four-hour interval from the

last dose of painkiller is because Acetaminophen is the normal painkiller used in this Health Care Unit, and diclofenac or indomethacin are used in case of need. The half-life of these drugs is four hours and after that the plasmatic density decreases^[25] hence, there is no interruption with the intervention (independent variable). If the drugs have been administered during the past four hours, the researcher will wait until the required time has passed and then the aromatherapy is started.

The vital signs of the patients were controlled just before the intervention. In the experimental group, the patients received a mixture of oxygen and Lavender essence for 15 minutes via a breathing face mask.^[26] The control group received only oxygen for 15 minutes via the face mask. The oxygen current was between five to six liters per minute with 40% FIO₂. The oily essence of Lavender was prepared by Barij Essence Pharmaceutical co. It had the quality license of ISO-9002 and was of ISO/IEC17025 standard. The 2% essence was produced via distillation of close blossoms and the carrier was olive oil. The trained nurse measured the patients' pain severity five, 30, and 60 minutes after the intervention. If the patient had some allergy to the essence or could not tolerate it, he/she was removed from the research. If any patient felt a severe pain during our one-hour intervention, he/she received a painkiller medicine and was eliminated from the study.

Statistics

The current study used the *t*-test, chi-squared test, and repeated measures of analysis of variance via the SPSS software, to analyze the results.

RESULTS

The mean age of the case group was 62.6 ± 4.86 and of the control group was 60.04 ± 8.92 . The data analyzed showed that the experimental and control groups had no significant difference with regard to the personal characteristics and the information related to the disease. The estimated *t*-test showed no significant difference with regard to age ($P = 0.318$) between the two groups.

The average body mass index (BMI) was 27.37 ± 4.86 , 26.84 ± 4.46 kg/cm² for the experimental and control groups, respectively. The estimated *t*-test also showed no considerable difference with regard to the BMI index ($P = 0.69$). All the participants of both groups were married. The other demographic and medical characteristics of the groups were compared using the chi-squared test and are represented in Table 1. As it could be observed, none of the characteristics

Table 1: The frequency distribution of the experimental and control groups regarding to demographic and medical characteristic

| Variables | Control | Experimental | P |
|------------------------|-----------|--------------|------|
| Gender | Frequency | Frequency | |
| Male | 14 (56%) | 12 (48%) | 0.57 |
| Female | 11 (%44) | 13 (52%) | |
| Education | | | |
| Illiterate | 12 (52%) | 13(48%) | 0.77 |
| Educated | 13(52%) | 12(48%) | |
| Employment | | | |
| Employed | 14(56%) | 12(48%) | 0.57 |
| Home keeper | 11(%44) | 13(52%) | |
| Residence | | | |
| City | 14(56%) | 13(52%) | 0.77 |
| Village | 11(44%) | 12(48%) | |
| Diabet History | | | |
| Yes | 10(40%) | 16(64%) | 0.89 |
| No | 15(60%) | 9(36%) | |
| Blood Pressure History | | | |
| Yes | 17(68%) | 11(44%) | 0.87 |
| No | 8(32%) | 14(56%) | |

showed a significant difference between the case and control groups.

The results of repeated measures analysis of variance revealed significant differences in the four phases of measurement in the case and control groups, when compared (before, after 5 minutes, after 30 minutes, and after 60 minutes) ($P = 0.001$). See Figure 1.

The multiple comparisons of Bonferroni, comparing the groups in four time frames, indicated that the greatest differences were related to the measurements taken before intervention and the 60 minutes after intervention (the first and fourth phases) ($P = 0.001$). A difference was observed in the measurements taken five and 30 minutes after intervention (second and fourth phases) ($P = 0.005$) too. The results of the *t*-test also showed differences in the case and control groups in all four time frames. See Table 2.

DISCUSSION

The results of the present study showed that inhaling Lavender essence was effective in the reduction of pain related to sternotomy after CABG. This study measured the pain severity in four phases (before, and 5, 30, 60 minutes after the intervention) in both the experimental and control groups. The results revealed that the case group reported lower pain intensity in phases 2, 3, and 4 of the measurements. The lowest pain severity rating was related to the fourth stage. Therefore, lavender essence affected the level of pain

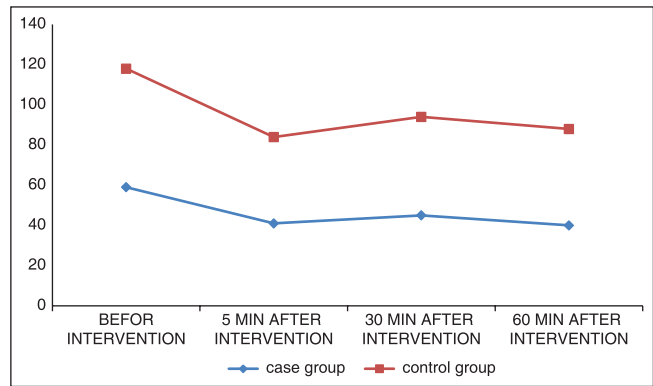


Figure 1: The figure shows the result of measurement of pain in four time frame. The pain reduced significantly after applying lavender when it is compared to control group who did not received lavender essence

among patients of the case group in comparison to the control group.

Burns (2007), declared that Lavender is the most used oil (in 45% of cases), which reduces the pain level (in 38% of the cases).^[27] The researcher could not find any published article related to the effect of aromatherapy on CABG, but there was some research on the positive effects of aromatherapy on pain. Vakilian (2012) studied the effects of inhaling lavender essence on labor pain,^[28] Han and colleagues (2006) examined the effects of aromatherapy on menstruation pain,^[29] Kim and colleagues (2005) studied aromatherapy effects on pain, depression, and rheumatoid arthritis^[30] and found promising results regarding reduction of pain after applying Lavendar essence, which is compatible with the findings of this study.

Alavi and colleagues also showed that inhaling Lavender during labor (pouring 0.1 CC lavender essence and 1 CC distilled water on a handkerchief and placing it near the mother's nose) could relieve pain during 30 and 60 minutes of the intervention in comparison to the control group.^[21] Jung and colleagues in a study aimed to decrease the request for pain killer opioids from patients with abnormal overweight, who were undergoing gastric regulative Laparoscopy. They reported that after surgery, the experiment group requested fewer drugs than the control group (46% compared to 82%).^[31] According to this study, Lavender essence could be administered to reduce the need for painkiller drugs and consequently the medical expenses, which is consistent with the results of present study. Although the study conducted by Kim and colleagues explored the pain killing effects of Lavender and showed that patients who underwent breast biopsy and received inhaled complementary Lavender 2% along with oxygen had more satisfaction with regard to perceived control of pain, but no changes were observed in perceived pain in comparison to the

Table 2: The mean and standard deviation of pain severity during four phases of pain ratings on two groups of experimental and control

| | Groups | | T-Test | |
|---|-------------|-------------|--------|-------|
| | Experiment | Control | T | P |
| Time | Mean(SD) | Mean (SD) | | |
| Pain severity before intervention | 5.62 ± 2.34 | 6.27 ± 2.2 | 1.01 | 0.316 |
| Pain severity 5 minutes after intervention | 4.26± 1.84 | 6.23 ± 2.2 | 3.42 | 0.001 |
| Pain severity 30 minutes after intervention | 4.39 ± 1.93 | 6.3 ± 2.21 | 3.24 | 0.002 |
| Pain severity 60 minutes after intervention | 4.11 ± 2.13 | 6.45 ± 2.23 | 3.78 | 0.001 |

control group^[22] — the result is inconsistent with our findings, which is explainable, as there is a difference in the kind of disease and pain intensity levels in the two studies. Evaluating the effects of lavender on implanting IUD related pain and anxiety, Shahnazi and colleagues (2012), found that smelling lavender had no impact on pain severity and only decreased the anxiety of experimental group.^[32] The causes for this inconsistency could be due to the smelling duration and different doses of the oil administered. Kiecolt-Glaser (2008), reported that due to desensitization of the olfactory receptors, the participants should not be subject to the un-attenuated essence of the plant for more than 20 minutes.^[33]

From a physiological point of view, theoretically aromatherapy could affect a person both psychologically and physiologically. The essence stimulates some receptors in the olfactory system and sends a message to the limbic system. The limbic system is the center of emotions and in turn could affect the heart beat, blood pressure, and respiratory system. The limbic system could secrete endorphins, enkephalin, and serotonin in reaction to stress, which in turn would lead to calmness and relaxation. The system has a close relationship with emotions and feelings with regard to the aroma types, and might secrete different neurotransmitters. The neurotransmitters could generate arousal, drowsiness, relaxation or joyfulness, and finally lead to mental and physical changes. On the other hand, paying attention to the olfactory and human sensations, the aroma could affect the mind and body. In fact, the odor is able to change human feelings. Re and colleagues (2000), in a study on the properties of Lavender aroma, concluded that the Linalool component of lavender could inhibit releasing acetylcholine, which changes the functions related to ionic channels on neuromuscular synapses. As Linalyl acetate has a narcotic function and linalool acts as a sedative factor, the function accounts for the pain relieving affect of lavender.^[34]

CONCLUSION

The results of the current and similar previous scientific researches suggest applying lavender essence in order to reduce the pain level in several kinds of pain, including global burden of disease (GBD), as it is a safe, low-risk, and cost-effective pain killer.

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