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The effect of bergamot orange essence on anxiety, salivary cortisol, and alpha amylase in patients prior to laparoscopic cholecystectomy: A controlled trial study

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Highlights

- Bergamot orange essence decreased anxiety in patients prior to laparoscopic cholecystectomy.
- Bergamot orange essence reduced salivary alpha amylase level in patients prior to laparoscopic cholecystectomy.
- In the intervention group, a significant difference was found regarding mean change of anxiety before and after the intervention.

Abstract

Background and purpose

This study aimed to determine the effect of bergamot orange essence on anxiety, salivary cortisol, and alpha amylase in patients prior to laparoscopic cholecystectomy.

Material and methods

This clinical trial with pre-post design was conducted on 60 candidates for cholecystectomy. The participants were randomly divided into an intervention and a control group. The intervention group participants

underwent aromatherapy using two drops of 3% bergamot orange essence, while the control group ones inhaled two drops of odourless grape seed oil. Anxiety mean score and salivary cortisol and alpha amylase levels were measured before and after the intervention.

Results

A significant difference was found between the groups regarding anxiety ($F=9.00$, $p=0.004$) and alpha amylase level ($F=9.46$, $p=0.003$) after the intervention.

Conclusion

Bergamot orange essence decreased anxiety and salivary alpha amylase level. Therefore, this method can be used as a complementary technique to reduce patients' anxiety prior to laparoscopic cholecystectomy surgery.

IRCT registration number

IRCT20171113037428N2. It is available in following website: https://www.irct.ir/trial/27696 ↗

Registration date

03/25/2018.

Introduction

Surgery, as an invasive technique accompanied with bleeding, pain, and risk of death, is considered to be a severely stressful condition for patients. Thus, most candidates for surgical operations experience anxiety. The prevalence of anxiety has been reported to be 8–11% among adults [1,2]. The most common factors causing anxiety in surgical patients include worries about family members, fear from postoperative outcomes and complications, postoperative pain, fear from physical disabilities, worries about regaining consciousness during the operation, fear from death, and fear due to unknown reasons [3,4]. Worries about delayed operations (69.6%), fear from intraoperative mistakes causing damage to the patient (64%), fear from not receiving sufficient attention from the treatment team (63.2%), and fear from not regaining consciousness after the operation (58.4%) have been reported, as well [5]. Preoperative anxiety can result in several problems, including intravenous access problems, jaw tension, and coughing during anaesthesia induction [4]. Thus, it may be accompanied with excessive consumption of sedatives, increased pain, postoperative nausea and vomiting, long hospital stay, increased risk of infection, and long recovery period [[6], [7], [8], [9], [10]].

Some complementary and integrative practices, such as non-pharmacological interventions, might improve physical, mental, and social dimensions of human beings [[11], [12], [13], [14], [15], [16]]. Common strategies for management of preoperative anxiety consist of pharmacological as well as non-pharmacological interventions. Effective non-pharmacological interventions in reduction of anxiety include acupuncture [17], massage therapy [18,19], music therapy [20], guided imagery therapy [21], and aromatherapy [22].

Aromatherapy using essential oils affects patients' health status and is considered to be a simple, low-risk, and inexpensive method for decreasing patients' anxiety [23]. Aromatherapy could reduce pain [24] and anxiety [24,25] in patients undergoing cholecystectomy. Various essential oils are used for aromatherapy. Bergamot (Citrus Bergamia Risso) belongs to the citrus family. Bergamot orange essence is made from its

outer skin layer and contains high amounts of limonene, linalool, and linalyl acetate [26,27]. The results of the research by Watanabe et al. indicated that inhalation of bergamot orange essence could be accompanied with physiological and psychological effects [28]. It was also reported that aromatherapy using bergamot essential oil decreased stress and anxiety in spite of limited evidence-based information [29]. It was also demonstrated that aromatherapy using bergamot orange essence was effective in reduction of patients' anxiety, depression, blood pressure, and heartbeat [30].

In order to investigate the impact of interventions on anxiety, mental evaluation instruments, such as Spielberger State-Trait Anxiety Inventory (STAI) and Visual Analogue Scale (VAS), can be used. However, utilization of these instruments may be faced with limitations in case patients are not able to provide reliable reports. In this context, using biomarkers as objective evaluation instruments will be helpful [31,32].

Cortisol is an important glucocorticoid in human beings whose production and secretion are increased by various mental stimuli. Salivary cortisol level is the accurate reflection of free and active cortisol blood level [33]. Alpha amylase is another salivary enzyme, which is secreted mostly from parathyroid glands and to a lesser extent from submandibular glands [34]. Salivary alpha amylase level is linked to norepinephrine plasma level and is increased due to physical and mental stresses [35].

Research has indicated that stress could result in an increase in salivary cortisol and alpha amylase levels. In fact, salivary alpha amylase is a stress biomarker [36]. Considering the impact of aromatherapy on anxiety and the need for identification of an effective aroma in reduction of patients' preoperative anxiety using evidence-based practice, the present study aims to determine the effect of bergamot orange essence on anxiety, salivary cortisol, and alpha amylase in patients prior to laparoscopic cholecystectomy.

Section snippets

Methods

This randomized clinical trial with pre-post design was conducted on two groups (intervention and control) in Imam Reza hospital, Mashhad, Iran. Mashhad is one of the megacities of Iran and the third author of this study is living and working in this city. The data were collected in 2018. The trial has been registered in the Iranian Registry of Clinical Trials (ID: IRCT20171113037428N2, date: 03/25/2018).

The target population included the candidates for laparoscopic cholecystectomy. It should …

Intervention

In the intervention group, two drops of bergamot orange essence (3%) were poured on a cotton ball attached to the patient's collar. Then, the patient was asked to breathe normally for 20 min. In the control group, two

drops of odourless grape seed oil were poured on a cotton ball attached to the patient's collar. The patient was asked to breathe normally for 20 min. It should be noted that all laparoscopic cholecystectomy surgeries were scheduled to be done between 9 and 9:30 a.m. The surgery …

Results

During the study period, no complications or side effects were reported because of using bergamot or odourless grape seed oil.

In this study, the mean age of the patients was 38.10 (SD = 12.37) and 38.40 (SD = 9.58) years in the intervention and control groups, respectively. The patients' ages ranged from 21 to 66 years. The results showed no significant difference between the intervention and control groups concerning age ($t = 0.10$, $p = 0.91$). The two groups were also homogenous regarding …

Discussion

This study showed that after aromatherapy using bergamot orange essence, a significant difference was observed between the two groups with regard to the mean score of anxiety. Review of the literature revealed no studies on the effect of bergamot orange essence on cholecystectomy patients' preoperative anxiety. Therefore, studies conducted on other herbal medicines or other kinds of surgeries were taken into consideration. It was reported that bergamot essential oil had anxiolytic-like/relaxant …

Conclusion

Considering the positive effects of aromatherapy using bergamot orange essence on anxiety and salivary alpha amylase activity, this aroma can be used as an available, effective, and inexpensive material in patients prior to laparoscopic cholecystectomy. …

Ethics approval

This study was approved by the Ethics Committee of Shiraz University of Medical sciences (code: IR.SUMS.REC.1396.131). Informed consent forms were signed by all participants. …

CRediT authorship contribution statement

Nilofar Pasyar: Funding acquisition, Formal analysis, Data curation, Writing - original draft, Writing - review & editing. **Masoume Rambod:** Funding acquisition, Formal analysis, Data curation, Writing - original draft, Writing - review & editing. **Fatemeh Araghi:** Funding acquisition, Formal analysis, Data curation, Writing - original draft, Writing - review & editing. …

Declaration of competing interest

None declared. …

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…Based on the detailed data of the 18 studies, a significant alleviation of preoperative anxiety was found for the lavender oil (Beyliklioglu and Arslan, 2019; Eslami et al., 2018; Ayik and Özden, 2018; Bozkurt and Vural, 2019; Stanley et al., 2020; Bakhsha et al., 2014; Braden et al., 2009; Rajai et al., 2016; Hosseini et al., 2016; Shahnazi et al., 2012) (SMD=−0.50, 95% CI [−0.73, −0.27], p<0.0001), citrus species aroma preparations (Eslami et al., 2018; Kim et al., 2014; Ni et al., 2013; Akhlaghi et al., 2011; Pasyar et al., 2020) (SMD=−0.86, 95% CI [−1.52, −0.20], p = 0.01), rose oil (Babaii et al., 2015; Fazlollahpour-Rokni et al., 2019; Dagli et al., 2019) (SMD=−0.43, 95% CI [−0.70, −0.15], p = 0.002) and multiple aroma preparations (Tsutsui et al., 2018) (SMD=−0.79, 95% CI [−1.28, −0.29], p = 0.002) subgroups, whereas the effect of eucalyptus-derived aroma preparations (Kim et al., 2014) (SMD=−0.74, 95% CI [−1.47, −0.01], p = 0.05) was not significant (Table 2, Supplementary file: Fig. S2). This subgroup analysis, based on the above 18 studies, revealed that inhalation aromatherapy (Babaii et al., 2015; Fazlollahpour-Rokni et al., 2019; Beyliklioglu and Arslan, 2019; Eslami et al., 2018; Bozkurt and Vural, 2019; Stanley et al., 2020; Bakhsha et al., 2014; Dagli et al., 2019; Tsutsui et al., 2018; Rajai et al., 2016; Hosseini et al., 2016; Kim et al., 2014; Ni et al., 2013; Shahnazi et al., 2012; Pasyar et al., 2020) (SMD=−0.51, 95% CI [−0.69, −0.33], p<0.00001), aromatherapy massage (Ayik and Özden, 2018) (SMD=−1.07, 95% CI [−1.54, −0.60], p<0.00001), and oral administration aromatherapy (Akhlaghi et al., 2011) (SMD=−1.57, 95% CI [−2.15, −0.99], p<0.00001) elicited significant improvements in preoperative anxiety, while no significant effect was observed in the mixed delivery mode aromatherapy subgroup (Braden et al., 2009) (SMD=−0.34, 95% CI [−0.68, −0.00], p = 0.05) (Table 2, Supplementary file: Fig. S3). Only 15 out of the 18 studies were included in this subgroup analysis because the session length of aromatherapy in the remaining three randomized controlled trials was not reported (Braden et al., 2009; Rajai et al., 2016) or not applicable (Akhlaghi et al., 2011).…

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