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Case Report

Effect of daily use of Lavender (*Lavandula angustifolia*) and Cedarwood (*Cedrus atlantica*) essential oils on nocturnal anxiety and respiratory disorders: a case report

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Abstract: Aromatherapy is a healing practice that has been used for centuries to promote physical and psychological wellbeing. The practice involves the use of essential oils (EOs) extracted from plants to treat a variety of conditions. Aromatherapy is believed to work by stimulating the sense of smell and the limbic system of the brain, which is responsible for emotions, memories, and learning. Lavender (*Lavandula angustifolia*) is a safe essential oil with well-established sedative and hypnotic properties Additionally, the properties of essential oils obtained from different species of *Cedrus*, such as *C. atlantica*, have been reported for their use in aromatherapy to obtain many clinical benefits traditionally attributed to the genitourinary, musculoskeletal, and cutaneous systems. However, the role of essential oil in the treatment of nocturnal anxiety and respiratory disorders in sleep is unclear, which makes clinical studies necessary to reinforce this hypothesis. Here, we present a clinical case of an adult patient with daily anxiety attacks and nocturnal breathing disorders effectively treated with the inhaled use of essential oil of Lavender (*Lavandula angustifolia*) and Cedarwood (*Cedrus atlantica*).

Keywords: Essential Oils; Lavender (*Lavandula angustifolia*); Cedarwood (*Cedrus atlantica*), Anxiety, Nocturnal breathing disorders.

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1. Introduction

Aromatherapy is a healing practice that has been used for centuries to promote physical and psychological wellbeing. The practice involves the use of essential oils (EOs) extracted from plants to treat a variety of conditions. Aromatherapy is believed to work by stimulating the sense of smell and the limbic system of the brain, which is responsible for emotions, memories, and learning. Several studies have shown that the use of EOs has a variety of potential benefits for human health [1].

Lavender (*Lavandula angustifolia*) is a safe essential oil with well-established sedative and hypnotic properties [2, 3]. In a randomized clinical trial, Lillehei and colleagues [2] showed that lavender inhalation combined with sleep hygiene practices significantly improved sleep matters compared to control or sleep hygiene practices alone. More recently, Samadi and colleagues [3] reported on the effect of lavender essential oil aromatherapy on the sleep quality of patients with major depression. Lavender aromatherapy was indicated to have a significant positive effect on patients' sleep quality, improving sleep ratings and reducing symptoms of insomnia. Furthermore, aromatherapy had no significant

adverse side effects [3]. These results suggest that inhaling lavender may be an effective intervention to improve sleep issues.

The properties of essential oils obtained from different species of Cedrus, such as *C. atlantica*, have been reported for their use in aromatherapy to obtain many clinical benefits traditionally attributed to the genitourinary, musculoskeletal, and cutaneous systems. Among the important pharmacological properties of Cedarwood (*Cedrus atlantica*) EO that support its clinical use, we can mention the anti-inflammatory and analgesic effects, as well as immunomodulators, antioxidants, antibacterials and insecticides [4]. However, the role of essential oil in the treatment of anxiety is unclear, which makes clinical studies necessary to reinforce this hypothesis.

Here, we present a clinical case of an adult patient with daily anxiety attacks and nocturnal breathing disorders effectively treated with the inhaled use of essential oil of Lavender (*Lavandula angustifolia*) and Cedarwood (*Cedrus atlantica*).

2. Case Report

2.1 Clinical case description

A 63-year-old male Brazilian patient presented with nighttime anxiety and difficulty breathing like symptoms of rhinitis, making it difficult to sleep. He has a history of previous heart attack and uses medication to control blood pressure, anticoagulants, cholesterol, and triglycerides, as well as medication for rhinitis, lower back pain and hip femur osteoarthritis (Table 1). The anxiety crisis began with the approach of the date of neurological surgery.

Table 1: Descriptions of clinical symptoms, medications used and time of use by the patient.

Clinical symptoms	Medicines	Usage time
Lumbar spine pain due to relative narrowing of the spinal canal at some levels.	1) Revange (Tramadol Hydrochloride 37.5 mg + Paracetamol 325 mg); 2) Dorflex (dipyrone monohydrate 300 mg, orphenadrine citrate 35 mg, anhydrous caffeine 50 mg) – muscle relaxant.	1) Since October 2022. 2) Use it when you feel you need a muscle relaxant.
Prior infarction: High pressure; Cholesterol; Triglycerides.	AAS 100 mg (anticoagulant); Naprix 2.5 mg (ramipril); Zimpass 40 mg + 10 mg (Rosuvastatin Calcium + Ezemitibe); LipLess 100 mg (Ciprofibrate).	Since January 2020 post heart attack.
Rhinitis.	Polaramine (dexchlorpheniramine maleate) 2 mg.	More than 5 years. Use only during rhinitis crises.

In the anamnesis, the patient reports anxious behavior over the years, without remembering the onset date of the symptom. The patient reports interrupted sleep crises associated with several nighttime awakenings (maximum of 4 hours of sleep per night) motivated by breathing difficulties, uninterrupted thoughts, and fear associated with the possibility of trauma that could lead to spinal damage or some sequelae of the surgery.

Additionally, the patient reported the occurrence of two nighttime anxiety crises due to the approach of the surgery. The first nighttime anxiety crisis occurred 28 days before the surgery, presenting difficulty in falling asleep added to an anxiety crisis described as "- *the head wouldn't stop working*", in addition to breathing difficulties attributed to rhinitis. At the time, the patient reports self-medication with an antiallergic for rhinitis associated

with a muscle relaxant. The patient reports the ineffectiveness of the medications. As an alternative therapy, the patient sought guidance in aromatherapy to solve the anxiety, difficulty in falling asleep, and breathing difficulties.

2.2 Protocol in Aromatherapy

Figure 1 describes the timeline of the aromatherapy protocol used for the patient. The treatment protocol consisted of using aromatherapy by inhalation of 6 drops of Lavender EO (*Lavandula angustifolia*) associated with 3 drops of Cedarwood EO (*Cedrus atlantica*) in a 350mL water-based diffuser. The chemical composition of EOs is described in table 2. The patient was recommended to use aromatherapy twice a day, the first in the morning for 30 minutes, and at night before sleeping for 2 hours, for 25 days, until the day of the neurological surgery.

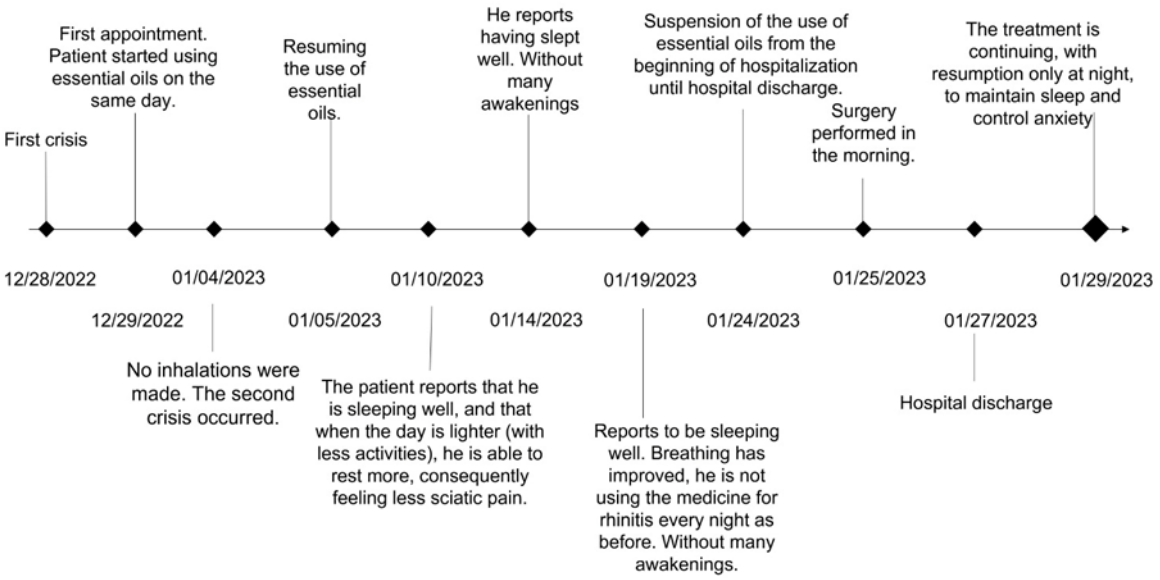

Figure 1. Timeline of the Aromatherapy Protocol.

Table 2: Descriptions of clinical symptoms, medications used and time of use by the patient.

Cedar Atlas (*Atlantic cedrus*)	**Lavender (*Lavandula angustifolia*)**
Brand: Laszlo	Brand: Laszlo
Bottle: 10 ml	Bottle: 10 ml
Origin: Morocco	Origin: France
Composition - Chromatography – (Supplementary file 1)	Composition - Chromatography – (Supplementary file 2)
Alpha Himakalene: 19,7%	3-Octanone: 0,2%
Gamma Himakalene: 11,1%	Myrcene: 0,2%
Gamma Curcumene: 2,6%	Zeta-Beta-Ocimene: 0,6%
Beta Himakalene: 41,3%	Epsilon-Beta-Ocimene: 0,5%
Alpha Calacorene: 0,5%	Linalool Oxide: 0,2%
Gamma Cadinene: 0,7%	Linalool: 50,5%
Calacorene: 1,4%	Sabinene t-hidrate: 0,4%
1-epi-cubenol: 0,9%	Camphor: 0,2%

Himacalol: 1,0%	Terpinen-4-ol: 0,3%
Isocedranol: 2,6%	Carvone:0,3%
Gamma Athantone: 2,4%	Linalyl Acetate: 42,8%
Trans-Alpha-Atlantone: 1,6%	Bornyl Acetate: 0,4%
Cis-Alpha-Atlantone:7,3%	Lavandulyl Acetate: 0,5%
	Beta-Elemene: 0,2%
	Beta-Caryuphyllene: 0,9%
	Beta-Farnesene: 0,5%
	Others: 1,3%

2.3 Effect of Lavender and Cedar Atlas EO aromatherapy on anxiety and respiratory crises when sleeping

With the daily use of Lavender and Cedar EOs, the patient reported having a restful and longer sleep, significantly reducing nighttime awakenings, estimating an increase in sleep duration to 6 hours per night. The patient reported that sleep onset was faster than before, with less agitation when sleeping, and improved breathing, resulting in a "*more peaceful*" sleep. There was also a significant improvement in nighttime respiratory crises, eliminating the need for medication for rhinitis symptoms. Finally, the patient reported substantial improvement with aromatherapy regarding anxiety, sleep, and breathing.

It is important to note that the patient reported a second anxiety crisis and respiratory difficulties that occurred on a night when essential oils were not used, approximately one week after the start of the treatment. In this second crisis, the patient reported self-medication with drugs that have a muscle relaxant effect, associated with medication for rhinitis and high blood pressure. The patient resumed the recommended aromatherapy treatment the next day and remained without associated crises until the day before hospitalization.

3. Discussion and conclusion

The present study presented an interesting case of a Brazilian patient with anxiety and respiratory disorders satisfactorily treated with aromatherapy by diffusion of Lavender and Cedar Atlas EO. A recent systematic review evaluated the effectiveness of aromatherapy on anxiety and sleep quality among adult patients in an intensive care unit. It was shown that aromatherapy has potential benefits, such as reducing anxiety based on the low Grading of Recommendations Assessment, Development and Evaluation (GRADE) of certainty of evidence and improving sleep quality based on the very low GRADE of certainty of evidence. However, the level of evidence of evaluated studies was low due to inconsistencies in findings and a high risk of bias [7]. This reinforces the importance of the advent of new case reports of aromatherapy use that promote the advancement of clinical studies in this field.

Specifically, our findings showed that Atlas Cedar and Lavender EOs reduced patient's perception of anxiety and respiratory symptoms when sleeping, which appeared less intense than before aromatherapy treatment. Lavender (Lavandula angustifolia) is a commonly used plant species in aromatherapy and has been evaluated in multiple studies for its effectiveness in reducing anxiety levels, especially during labor. Various methods of using lavender, such as massage, acupressure, tapering, compression, footbath, birthing pool and inhalation have been studied [8].

Aromatherapy based on lavender EO was found to significantly reduce anxiety during the first phase of labor in the study by Burns et al. [9]. The studies by Mirzaei et al. [10] and Tafazoli et al. [11] showed that the anxiety level in the group using lavender inhalation significantly reduced within 60 minutes of inhalation, and Tafazoli et al. [11]

also found that inhalation of lavender instantly reduced anxiety levels in the intervention group.

There are few studies that reflect the role of lavender EO in respiratory symptoms. Experimentally, a very important study reported that inhalation of lavender essential oil suppresses allergic airway inflammation and mucous cell hyperplasia in a murine model of asthma. In this study, BALB/c mice were sensitized with ovalbumin and challenged with nebulized ovalbumin to induce asthma. The Lavander EO-Asthma experimental group, which received Lavander EO inhalation, showed lower airway resistance, total cell numbers, eosinophils, and mucin hyperplasia compared to the Control-Asthma group. Thus, lavender EO proved to inhibits allergic inflammation and mucous cell hyperplasia may be considered an alternative medicine for bronchial asthma [12].

Individual case studies for the treatment of nocturnal anxiety with the use of lavender EO were not identified, especially when associated with the concomitant use of Cedarwood EO. About this, Saab et al. [13] reported in their review study aspects of ethnobotany, phytochemistry and pharmacology of the genus Cedrus, highlighting its cytotoxic, spasmolytic, immunomodulatory, antiallergic, anti-inflammatory and analgesic properties. It is mentioned that Cedrus species have potential for the development of drugs with fewer side effects than current synthetic drugs. It is noteworthy that the major components of C. atlantica growing in Morocco are α-pinene, himachalene, β-himachalene, cis-α-atlantone, himachalol, germacrene D and β-copaene [14]. The French pharmacopoeia recommended the liquid tar derived from the destructive distillation of C. atlantica as the best Cade oil. In a study by Saab et al. (2012a), it was found that the essential oils of C. atlantica stimulated erythroid differentiation and inhibited the growth of K562 leukemia cells [15]. However, the role of C. Atlantica EO on anxiety and sleep-disordered breathing is unclear.

Our results highlight the role of using mixed EOs of Lavender and Cedar Atlas in controlling respiratory and anxiety crises in a clinical case of a Brazilian patient. To our knowledge, this is the first clinical report reporting a significant improvement in anxiety and breathing in a patient with the use of inhaled aromatherapy with these essential oils. We believe that this clinical case reinforces the need for more preclinical analyzes and clinical trials to evaluate the potential of Lavender (*Lavandula angustifolia*) and Cedarwood (*Cedrus atlantica*) essential oils for drug development.

Finally, we believed that aromatherapy may be considered as a complementary option to improve anxiety, respiratory and sleep quality among care patients. However, proper training by a professional clinical aromatherapist is needed to ensure safe handling of essential oils and monitoring for adverse events. Further research is needed to strengthen the clinical evidence.

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Research Ethics Committee Approval: We declarethat the patient approved the study by signing an informed consent form and the study followed the ethical guidelines established by the Declaration of Helsinki.

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Conflicts of Interest: We have no conflicts of interest to disclose.

Supplementary Materials: None.

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