



The effect of a beeswax, olive oil and *Alkanna tinctoria* (L.) Tausch mixture on burn injuries: An experimental study with a control group



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ABSTRACT

Objectives: This study was planned to investigate the effect of a mixture of beeswax, olive oil and *A. tinctoria* (L.) Tausch on burn wounds to determine the impact on burn healing, pain during dressing changes and duration of hospital stay.

Methods: The study was conducted between May 2014 and August 2015 in the Burn Unit of Atatürk University Research Hospital. The sample of this experimental study consisted of 64 patients (31 experimental group and 33 control group) who met its inclusion criteria. While the specially prepared dressing material was applied to the experimental group, the control group was administered the clinic's routine dressing. The injuries were photographed before each dressing. Each picture was uploaded to a computer for measurement with ImageJ software. Numbers, percentages, chi square, Independent samples *t*-test and Mann-Whitney *U* tests were used to assess the data.

Results: The patients in the experimental and control groups had similar descriptive characteristics and burn injury features ($p > 0.05$). The average age of the patients in the control group was 5.52 ± 0.64 years, and 6.68 ± 1.09 years in the experimental group. The majority of the patients were male (control: 54.5%, experimental: 58.1%). Boiling liquids were the most common cause of both groups' burns (control: 93.9%, experimental: 83.9%). The most common first aid practice used was the application of cold water (control: 75.0%, experimental: 43.6%). The epithelization initiation time average of the experimental group patients (3.00 ± 0.85 days) was found to be earlier than that of the control group patients (6.90 ± 1.77 days), and this difference was statistically significant ($p < 0.05$). The mean pain scores experienced by the patients in the experimental group during dressing (8.12 ± 1.38) were determined to be lower than those of the control group (9.39 ± 1.05), and this difference was statistically significant ($p < 0.05$). It was also found that mean hospitalization durations of the patients in the experimental group (8.22 ± 3.05) were shorter than those of the control group (14.42 ± 7.79), and this difference was also found to be statistically significant ($p < 0.05$).

Conclusion: When a beeswax, olive oil and *A. tinctoria* (L.) Tausch mixture was applied to second degree burns, this accelerated epithelization, reduced the pain experienced during dressing changes and shortened the hospital stay durations of the patients.

1. Introduction

Burn injuries are a serious public health problem in Turkey and developing countries. They are one of the most severe traumas for the human body and affect people both physically and psychologically.^{1,2} Tissue injuries caused by burns have high rates of morbidity and mortality and require long-term hospitalization.³ Since they cause severe pain, significant changes in physical appearance, loss of limbs and deformities, burns are among the most serious health problems globally.^{4,5}

In the USA, 2.5 million people are exposed to burns every year, more than 2 million people receive medical care for burn injuries, and half of these are children.^{6,7} According to 2014 World Health Organization (WHO) data, 265,000 people died due to burn injuries, and 96% of these deaths occurred in underdeveloped and developing countries.⁸

Throughout the centuries, experts have searched for ideal treatment for burns and burn pain.^{9,10} While some treatments based on traditional practices appear as complementary or supportive practices in burn injury treatment, practices that are not based on a scientific foundation can also be found as well. In the literature, it is observed that olive oil,

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unpeeled apple, butter, century oil, potato, beeswax, egg yolk, cold application, toothpaste, mud, lime putty, yogurt, sauce/paste and salt are the most frequently used treatments for burn injury in folk medicine.^{11–13} In folk medicine, beeswax, olive oil and *A. tinctoria* (L.) Tausch (*A. tinctoria*) are also frequently used for burn care and treatment.^{11,14,15} *A. tinctoria* of the genus *Alkanna* belongs to the Boraginaceae family of the Tubiflorae order.¹⁶ The flowers usually have 5 petals. From April to July, the blue-blooming plant grows to between 10 and 30 centimeters.¹⁷ *A. tinctoria* grows widely in Europe, the Mediterranean and Western Asia. The wound healing characteristics of *A. tinctoria* has also been considered to make it useful for traditional ointments and pastes for wounds. Its anti-nociceptive and anti-inflammatory activities have been used in folk medicine to cure inflammatory and pain-related ailments.¹⁵

It has been determined that *beeswax*, *olive oil* and *A. tinctoria* are traditionally used in folk medicine in the treatment of burn injuries; however, no studies have been conducted in accordance with scientific norms about their efficacy in the treatment of burn injuries in order to include them in modern medical practices. It is thought that the results obtained from this study will make a positive contribution to the treatment and care of burn injuries, guide future studies in this field and contribute to the scientific literature.

This study was planned to investigate the effect of a mixture of beeswax, olive oil and *A. Tinctoria* (L.) Tausch on burn wounds to determine the impact on burn healing, pain during dressing changes and duration of hospital stay.

2. Methods

2.1. Type of study

This study was conducted as an experimental study. It could not be conducted as randomized controlled because the hospital stays of the patients were not the same, patient rooms in the clinic could not be separated and the wound dressing room could be seen by all patients.

2.2. Population and sample of the study

It was selected from the specified population using improbable random sampling (choosing appropriate people in terms of research criteria as they came into the burn unit and asking them if they wanted to participate in the study). Five patients in the control group and four patients in the experimental group were excluded from the study since they did not meet its inclusion criteria. These patients were excluded for leaving hospital before the end of treatment or having surgery. Since there was no previous research, power analysis was done at the end of the study. It found that the significance level was $p = 0.05$, the confidence interval was 95%, and the representation power of the population was 99%. To prevent the possibility of affecting the interventions to be administered to the patients in the unit, the patients in the control group were included in the study first, and after that the patients in the experimental group were included.

2.3. The inclusion criteria of the study

The inclusion criteria of the study were: patients presenting to Ataturk University hospital, having second-degree burns, being more than three years old and less than 65 years old, burns not being infected, not having any chronic disease that could negatively affect healing, voluntary participation, having extremity burn injuries, having burns other than chemical and electrical burns with certain borders and not having undergone a surgical procedure that could affect healing.

2.4. Materials used for data collection

2.4.1. Questionnaire

The questionnaire was prepared by reviewing the related literature.^{18–22} The questionnaire was used to determine the descriptive characteristics of the patients and the characteristics and exposure properties of their burns.

2.4.2. Visual Analogue Scale (VAS)

The Visual Analogue Scale (VAS) was used in order to evaluate the pain intensity of the patients. The VAS is a 10 centimeter ruler indicating no pain at one end and unbearable pain at the other end. Patients are asked to evaluate their pain intensity between 0 and 10 (0 means no pain, and 10 means unbearable pain).²³ The VAS is a clear, easy to use scale for patients over five years of age.²⁴

2.4.3. Facial expression scale (FES)

This is facial expression scale which determines the intensity of pain. Facial expressions at one end of the scale signify no pain, and they signify very severe pain at the opposite end.²³ The FES is recommended for use with young children who cannot use the VAS because their language skills and mental capacities are not yet sufficiently developed.²⁴

2.4.4. Digital camera with interchangeable lens

Since visualization and evaluation are among the most frequently used objective methods in the evaluation of injuries,²³ in this study the injuries were followed up by taking photos and evaluation was done with ImageJ software (NIH, Bethesda, MD, USA).

2.4.5. Dressing material used in the experimental group

The material used was a mixture of beeswax, olive oil and *A. tinctoria*.

2.4.5.1. Beeswax. Beeswax is a mixture of saturated and unsaturated acids with a high molecular weight that includes both alcohol and esters. The density of beeswax is almost one (0.966). Its melting point is 62–65 °C. When applied to living tissue, it does not produce any allergic or toxic effects.²⁵ The use of beeswax is very common. In the literature, it has been stated that beeswax is an antioxidant that has antibacterial properties, increases cytokine production in skin cells and decreases exudation in the injury area.^{11,18,25,16,26}

2.4.5.2. Olive oil. In addition to bactericidal activity similar to that of hydroxytyrosol and oleuropein, olive oil contains at least 30 phenolic compounds.^{18,27} It is especially effective against the *Klebsiella* and *Pseudomonas* bacteria species, which are resistant to antibiotics. Oleuropein has strong antimicrobial properties.¹⁴ Moreover, olive oil, which is rich in flavonoids, is an antioxidant that has anti-inflammatory, antioxidant and cell protective effects that inhibit the release of IL6, IL8 and histamine.^{27,28}

2.4.5.3. *A. Tinctoria* (L.) Tausch. *A. tinctoria* of the genus *Alkanna* belongs to Boraginaceae family of the Tubiflorae order. It contains a red naphthoquinone pigment produced from cinchonine plant cells.¹⁶ It is used in the pharmaceutical and cosmetics industries and as a dye in liquors.¹⁷ *A. tinctoria* exhibits antimicrobial properties against *Staphylococcus aureus* and *Staphylococcus epidermidis*. It is said to be effective for healing injuries. It is non-toxic and has antitumor and antithrombotic properties.^{15,29} Alkannin and shikonin are chiral-pair of naturally occurring isohexenylnaphthazarins. They are found in the external layer of the roots of at least a 150 species that belong mainly to the genera *Alkanna* of the Boraginaceae family.²⁹

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