

The Effect of Sesame Oil and Comparison with Mupirocin Ointment on Partial Thickness Burn Wounds – A Randomized Clinical Trial

Seyed Jalal Eshagh Hoseini¹

Abstract

Background: The burn injury is one of the most common types of injuries in the world. It causes the patients to face a heavy health and economic burden. The present study aims at investigating the healing effects of sesame oil on facial burns and comparing them with those of the mupirocin ointment

Methods: The current single-blind randomized clinical trial studied 50 patients with facial burns attending to the Burn Unit of the Nekuee Hospital in Qom. Patients were randomly divided into intervention and control groups. Patients in the intervention group received sesame oil while the control group patients were treated with mupirocin ointment. The duration of wound healing was compared between the two groups.

Results: The time of restriction and the start of healing of the wound was 4.9(1.21) days (mean / SD) in sesame oil and 5.84 (0.99) days (mean/SD) in mupirocin ointment. The time of complete healing was 17.04 (2.35) days in sesame oil and 17.50(2.10) days (mean/SD) in mupirocin ointment.

Conclusion: Significant differences were observed between sesame oil and mupirocin ointment ($p = 0.03$) in terms of their healing effect in the start of the healing process of burn wounds. The average time for complete wound healing was similar in the two groups. The application of topical sesame oil reduces the time that it takes for the healing of burn wounds to start.

Keywords: sesame oil, mupirocin, burn.

I. Introduction

burn is one of the most destructive injuries and a global health care issue.(1) Burn injuries are the fourth most frequent cause of trauma worldwide.(2) These injuries cause a heavy economic burden and profound morbidity and mortality. The average cost of care for each burn patient in high-income countries is 88,218 \$ (range 717,306 -704 \$).(3, 4) Low- to middle-income countries have the highest rates of fatal fire-burn injuries. These countries usually do not have enough supplies to lower the incidence and severity of burn injuries.(5). Burn injuries are the fourth most frequent cause of trauma worldwide. There is evidence that burn

¹ Assistant professor Surgery Department, Qom University of Medical Sciences, Qom, Iran

can deeply affect patients' quality of life and disturb their physical, psychological, social and spiritual activities. (24-26) Topical medications would control the pain, heal the wound faster, and prevent wound infection and dryness. (26, 27) In recent years, great progress has been made in the management of burn wounds, however, infection is one of the most important problems in the treatment of burn wounds.(6) Topical antimicrobial agents can be used to lower the colonization levels and prevent skin infection and sepsis.(7) Recent studies have shown the increasing resistance against topical antibiotics as well as side effects.(8, 9)

Mupirocin is among the most common topical antibiotic agents used for burn treatment. It has anti Gram-positive activities and is rarely active against Gram-negatives.(10, 11) mupirocin may have some Local side effects such as burning, stinging, itch, and rash. (8) Recent studies have reported an increasing level of mupirocin resistance worldwide.(9)

Sesame oil has been used as a traditional medicine for a long time. It has anti-inflammatory, antioxidant, anti-mutagenic effects. Sesame oil can be used as skin protection from UV² (ultraviolet) rays, wound healing agent and treatment for many disorders such as eye diseases and itching.(12-14) Some studies reported antibiotic effects of sesame extracts.(15, 16). Sesame oil is the seed extraction of *Sesamum indicum*. It has been used as a traditional medicine for more than 5000 years.(28) Sesame seeds are grown in over 7-8 million hectares of farms worldwide. Its annual production is 3.84 million tons. Oil makes up about 50 % of the sesame seeds.(29) The unique properties of sesame have attracted scientists' attention and led to numerous studies on the chemistry and bioactivity of this seed.(30, 31) Sesame oil is available everywhere and has a low price. It should be noted that the wound healing effects of sesame oil have been spotted in other kinds of wounds in the previous studies.(20, 21, 23) Some studies have shown the potential effect of sesame oil on wound healing, pain relief, and promoting skin barrier homeostasis -resulting in better wound healing- in both human and animal cases.(17-21). One of the problems of mupirocin impregnated dressing is that it should be changed daily. This wound dressing changing can cause a lot of pain for the patient. While sesame impregnated dressing does not need to be changed. By definition, good wound care is supposed to facilitate wound healing and prevent infection. There is no evidence that topical antimicrobial agent is the best choice for burn wound coverage to prevent infection. Despite the wound healing effect of sesame oil and its potential effects on burn wounds, few studies have compared the efficacy of this oil with that of mupirocin in the treatment of burns.(6, 22)

The present study aims at investigating the therapeutic effect of sesame oil on facial burn injury and comparing it with that of mupirocin ointment.

II. Methods

Study design

This randomized controlled trial was done at Nekuee hospital (in Qom). This trial was approved by the ethical committee of Qom University of Medical Sciences (Project No.: **34/12078/۴**) and was registered in Iran Registry of Clinical Trial (RCT registration code: **IRCT201201188769N1**).

Participants

We enrolled 50 patients aged more than 13 with a facial burn wound. The inclusion criteria for patients enrolled in the study were: facial burn; aged more than 13; consent to participate in the study; and referred to the hospital within 24 h after the occurrence of the injury. We excluded patients with underlying conditions such as diabetes, chronic renal or hepatic diseases, and those with simultaneous inhalation injury, 3rd degree burns, multiple traumas, eyelid burn, and skin lacerations.

All patients provided written informed consent in their own language before any trial-related procedures started.

Randomization and procedures

The sample included 50 available patients who were divided into two groups using a simple randomization method and table of random numbers. The intervention group consisted of 25 patients who were treated using sesame drops. After washing the wound with normal saline solution, drops of sesame oil were applied over the wounds and the wounds were kept constantly moisture until the patients were discharged by one of the researchers. The control group consisted of 25 patients; they were treated using mupirocin ointment by swab or spatula and some times supported with guaze every 12 h until the patients were discharged. Due to ethical issues, the Ethics Committee did not allow us to use placebo in our project. The ethics committee's reason was the possibility of increasing pain, prolongation of the course of healing, bad scar tissue formation and cosmetic problems and a lack of healing. the standard treatment was used in the control group. The duration of wound healing was compared between the intervention and control groups. The researchers recorded the time of restriction of wound(the decrease of discharge from wound ,wound contraction and pink coloration), and complete healing by reepithelization of the wound. Patients and researchers were aware of the treatment groups.

Statistical analysis

The collected data were analyzed using the SPSS 21 software to compare the qualitative variables between the two groups. The T-test and Kay 2 test were used to compare the two groups.

III. Results

The patient's characteristics include the demographic and medical characteristics of the sample (Table 1). Statistical tests were used for the homogeneity of the different patient characteristics (e.g. age, gender, percentage of burn, cause of burn), as well as the intermediate outcomes (Kay 2 test, t-test). Patients of all groups had similar characteristics concerning the most important parameters such as burn degree ($p > 0.5$ in all cases) and age ($p > 0.5$ in all cases).

Table 1. Patient's characteristics and homogeneity tests

	Mupirocin (control) Group	Sesame(TREATMENT) Group	Mean difference/ \times^2	pv
	Mean (sd)/ (%)	Mean (sd)/ (%)		

Age	30.92(12.70)	32.44(13.60)	-1.52	0.68*
Gender	Male:17 Female:8	Male:16 Female:9	0.09	0.77&
Percentage of burn	1%: 14(56%) 2%: 8(32%) 3%: 3(12%) 4%: 0	1%: 12(48%) 2%: 10(40%) 3%: 1(4%) 4%: 2(8%)		
Cause of burn	Boiling water:7 Oil:4 Fire flame:14	Boiling water:6 Oil:5 Fire flame:14	0.18	0.90&

*: T-test &: Kay 2

Table 2. results

	Mupirocin (control) Group Mean (sd)	Sesame(TREATMENT) Group Mean (sd)	Mean difference	pv*
Time of start healing	5.84(0.99)	4.90(1.21)	1	0.002
Time of complete healing	17.50(2.10)	17.04(2.35)	0.44	0.49

*: T-test

Significant differences were seen in days of wound restriction and the beginning of healing between the group that received sesame oil and the one that was treated with mupirocin ointment (mean: 4.90 sd=1.21 vs mean=5.84 sd=0.99, p = 0.002). No significant difference was seen in the time (i.e. days) of complete healing between sesame oil and mupirocin ointment treatments: 17.04(2.35) mean/SD vs17.50 (2.10) mean/SD, p = 0.49

IV. Discussion

Inflammation is the natural response of the body to wounds, and it accelerates the process of wound healing. However, inflammation causes a delay in the healing process by creating free radicals. The two main ligands of the sesame extract reduce the inflammation and free radicals in the wound site through their anti-inflammatory and antioxidant activities, as along with their synergistic activity with other antioxidants. Moreover, these ligands are also effective during the other stages of wound healing, including wound contraction.(32)

The antibiotic properties of Mupirocin is used as a treatment for burn wounds. Despite its therapeutic benefits, it has side effects such as skin burning, stinging, itching, and producing rashes.(8) Recent studies have reported an increase in mupirocin resistance.(33)

The evidence in this clinical trial demonstrated that sesame oil has a better wound healing effect on burns than mupirocin. Sesame oil has been reported to be effective for wound healing especially burn wounds in human(34, 35) and animal(20, 21, 23) models. The study conducted by Dorinne Gray et al. aimed to evaluate the effects of universal decolonization of mupirocin and hypochlorous acid on burn patients. Universal decolonization causes a significant decrease in total MRSA³(Methicillin-resistant *Staphylococcus aureus*) infections in their burn unit. they suggested that a regimen of the hypochlorous acid solution and nasal mupirocin can be used for decolonization in burn patients.(36) Liju Tao et al. similarly conducted a clinical trial study on the antibiotic effect of the topical mupirocin at the central venous catheter exit site. The study compared the efficacy of povidone-iodine and povidone-iodine plus mupirocin. The study showed that mupirocin is effective in the prophylaxis of central line-associated bloodstream infection (CLABSI).(37) The study conducted by Seyed Mahdi Tabatabaei et al. reported that a combination therapy of se Methicillin-resistant *Staphylococcus aureus* same oil and pumpkin with different concentrations improved burn wound healing in mice. Also, combination therapy had a better effect than using sesame oil and pumpkin separately. (38) Another study conducted by Nilufar Nekuzada et al. showed that the external use of *Sasumum Indicum* can reduce chemotherapy-induced phlebitis. Phlebitis affected 10% of the intervention group (treated with *Sasumum Indicum*) and 80% the control group. The author noted that factors such as age, sex, type and the amount of chemotherapy are effective on the phlebitis incidence and its frequency, so they were matched in the intervention and control group. (34) Setareh Tehrani et al. used sesame ointment in 40 male Wistar rats and showed that sesame improved wound healing process and tissue regeneration in burn wounds.(21)

the results of the present study showed that the application of sesame oil reduced the time before which the healing of burn wounds started in patients suffering from facial burn much more significantly than those treated with mupirocin cream.

The use of sesame oil is very simple and requires only a dropper and it fills the face folds easily. The cost of treatment with sesame oil is low. However, rubbing the ointment on the face is painful and usually

requires a well-trained person. The results also suggested that sesame oil drop may be considered for further investigation as a potential first-line treatment modality for facial burns.

V. Conclusion

The results of the present study indicated a significant difference between sesame oil and mupirocin ointment treatments ($p = 0.03$) in the time that it takes for the healing of burn wounds to start. The average time for complete wound healing was similar in both groups. The application of topical sesame oil reduces the time that it takes for the healing of burn wounds to start.

VI. Recommendations

In light of the above-mentioned limitations, our findings should be interpreted with some caution and must be verified in a larger multi-center trial. We recommend that such a trial should be conducted shortly.

Declarations

Trial registration:

RCT registration code: **IRCT201201188769N1**. Registered 19 September 2012 - Retrospectively registered. <https://fa.ict.ir/trial/9263>

Ethics approval and consent to participate:

Approved by the ethical committee of Qom University of Medical Sciences Project No.: **34/12078/۴**

This study was approved the ethical committee of Qom University of Medical Sciences (Qom, Iran). Written informed consent was obtained from our subjects. The patients were treated with sesame oil or mupirocin ointment after approval from the the ethical committee of Qom University of Medical Sciences (Qom, Iran).

Written informed consent for participation in the study was obtained from parents or guardians of patients under 18 years old.

Consent for publication:

The file has been submitted as "Consent for publication"

Availability of data and material :

The data supporting our findings are available for any evaluation and can be provided by the author. However, some of our participation wish not to share their primary data. But their secondary data and Analytical data can be provided upon request.

Competing interests :

there are no Competing interests.

Funding:

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Authors' contributions:

Seyed Jalal Eshagh Hosseini

S.J.E.H conceived and designed the experiments. Also, he performed the clinical and analytical experiments and wrote the paper. DM and SM performed the biological experiments and analyzed the data. The author read and approved the final manuscript.

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