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KEYWORDS: sesame oil, silver sulfadiazine 1% cream, second-degree burn

A COMPARATIVE STUDY OF THE EFFECTS OF SESAME OIL AND SILVER SULFADIAZINE CREAM ON WOUND HEALING OF PARTIAL THICKNESS BURN



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ABSTRACT

Introduction:

Burn is the world's fourth most frequent cause of trauma which has a wide variety of topical treatments for healing the wounds. We investigate healing effect of sesame oil on second-degree burn and comparing with silver sulfadiazine 1% cream.

Materials and Methods: The current single-blind randomized clinical trial studied 364 patients with second-degree burn attending to Burn Unit of Nekuee Hospital in Qom. The cases were randomly divided to intervention and control groups. Patients in the intervention group received sesame oil while the control group patients were treated with silver sulfadiazine 1% cream. The duration of wound healing was compared between the groups

Findings: The average time of wound healing was significantly shorter in the intervention group

Conclusion: Application of topical sesame oil reduce healing time of burn wounds.

Introduction

Of the more than one million burn injuries incurred annually in the United States alone, the majorities are minor and can be managed on an outpatient basis. [1] In the USA alone, there are 486 000 burn injuries (43% caused by fire or flame, 34% by scald, 9% by contact, 4% by electrical burns, 3% by chemical burns and 7% by other reasons) each year.3 More than 60% of the acute hospitalizations are caused by burn injuries.

Healthcare costs for burns are high; a median cost of \$44 024 is needed for one patient.[8] Despite of available of several different medications for wound healing most medical professional increasingly showing interest to use natural medicines. Since the ancient times, physicians have looked for medications to relieve pain and decrease healing time of the burn wounds, so they had tried out different materials such as honey, fish oil, aloe Vera, potatoes, etc. (16). By definition the good wound care supposed to facilitate wound healing and prevent infection. There is no consensus on which topical antimicrobial agent or dressing is best suited for burn wound coverage to prevent or control infection[2,3] The present study intends to investigate the therapeutic effect of sesame oil on second-degree burn injury and to compare it with silver sulfadiazine 1% cream.

Review of article

Topical wound application (such as honey, aloe vera[7], antibiotic ointments/lotion and etc.) is used in superficial burn. Although patients with superficial burns do not need medical treatment but evidences shows that topical nonsteroidal anti-inflammatory drugs

(NSAIDs) and aloe vera can reduce their pain (17).

Dressing with Silver sulfadiazine 1% cream is one of the most common treatments for burn wounds since 1986. It reduces infection risk in the burn wound (18). However, there are several reports about disadvantage of this cream such as not penetrating into wound scars, gram-negative microorganisms' resistance, and delay in healing time in minor burn injuries (19). These modern dressings, compared with traditional dressings, have several advantages of keeping a moist wound environment to facilitate healing, providing an effective barrier to reduce the risk of infection and maintaining maximum contact with the wound to relieve pain.[9] Recently new products present for burn wound healing. They can heal the wound faster, better pain reliever, require less frequency dressing changes and increase patient satisfaction (19 ,20). SSD and related agents should not be used in women who are pregnant or breastfeeding, or in infants younger than two months old[10] . In addition, there are potential adverse effects. As an example, SSD will form a pseudoeschar that is loose at the edges, which can promote bacterial proliferation. The pseudoeschar requires removal or debridement to improve the ability to monitor the wound state and facilitate reepithelialization. For wounds covering more than 50 to 60 percent of total body surface area, SSD does not consistently prevent or suppress bacterial growth, particularly of Gram-negative bacteria [11-12].

SSD impedes reepithelialization [1]. As a result, SSD should be stopped when there is evidence of reepithelialization Topical sesame oil application can be effective in tissue regeneration (21). A similar study conducted by Kiran et al. reported a shorter length of epithelialization and wound closure in mouse treated with sesame seeds and oil compared to the control group. Ebrahimi Fakhar et al. reported that application of sesame oil in burn wound is competitive with conventional topical chemical that they help debridement of necrotic tissues (22).

Methods

The present study is a randomized single-blind parallel clinical trial. The participants were patients with second-degree burns attending the Burn Unit of Nekuee Hospital in Qom. The volume sample was calculated as 30 patients for each group considering the presumed values ($\alpha=0.05$, $\beta=20\%$) so the minimum volume sample was set at 60. The samples were selected using convenience sampling method or based on probability proportional to size sampling technique. The inclusion criterion was second-degree burn. Exclusion criteria were (1) inhalation injury (2) comorbidity (3) first or third degree burn (4) burn size >25% of TBSA (5) age below 11 years old (6) burn in the face. Painful dermal involvement and redness or waxy white color with weeping and blisters consider as second degree burn. We describe study to the patients and we got consent in order to participate in the study

The participants were divided randomly into an intervention group

(who received sesame oil) and a control group (who received silver sulfadiazine 1% cream). Sesame oil (made by Merck Factory) as intervention and the topical silver sulfadiazine 1%cream(Flamexin) as a gold standard were used. Sesame oil and silver sulfadiazine cream applied on burn wounds without any additive. Intervention group wounds were covered with a cellophane-made dressing and control group dressed with simple gauze. The dosage of sesame oil and silver sulfadiazine 1% cream was determined based on the size of the injury. Silver sulfadiazine 1% cream was applied once per day. In intervention group dressing didn't change except it seemed dry or existence massive purulent discharge. We monitored time to reepithelialization, pigmentation, transepidermal water loss, and hydration and followed at 1-month post burn. First signs of healing include restriction and regression of wound, appearance of granulation tissue. Complete epithelialization assign as end point of treatment. This study also considered healing time in both intervention and control groups. The data were collected using patients' clinical documentations as well as a researchers-made checklist

Statistical analysis

The collected data were entered into SPSS ver.22.0 and the quantitative data were described using mean and standard deviation while the qualitative data were explained using frequency and percentage. The qualitative data were compared employing Chi-square test and the quantitative data were compared between groups by employing Independent T-test. The level of significance of all tests was set at 95% and the results below 0.05 were considered as being statistically significant.

Results

The characteristics of participants

In total, 427 patients (accordance with inclusion & exclusion criteria) attended the Burn Unit at Nekuue Hospital in qom (iran) during 2014 -2015. 63 cases deleted due to no further attendance. 364 cases were investigated (186 case in control group and 178case in intervention group). Among which 250 (68.7%) patients were men 119in control and 131 in intervention group and 114(31.3%) patients were women 61 case in control group &53 in intervention group. he youngest patient was 11years old and oldest patient was 82 years old. The mean age of participants was 29.91±11.98 years. The numbers of patients admitted in hospital were 78 (21.5%) and 286 (78.5%) cases followed in outpatient setting. The average of burn size (percentage of total body surface area) was %6.25±3.11 in intervention group and 7.42±2.96 in control group.

The most common sites of burn injuries were hands and forearms. The most common cause of burn injuries was hot water (159 patients 44.1%), and there was no statistically significant difference between the frequency distribution of burn causes among groups (p=0.634).

Table 1. The frequency distribution of age and size

Variable	Sesame oil	Silver sulfadiazine	P-value
Age	29.85±3.08	28.32±4.01	<0.0001
TBSA percentage	6.05±2.02	5.25±2.85	0.0022

Table 2. The frequency distribution of burn sites in participant

Total	Silver sulfadiazine	Sesame oil	
183	85	98	Hand(s)+ forearm(s)
5	87	78	Arms
158	75	83	Foot(s) + Leg(s)
68	39	29	Thigh(s)

Table 3. The frequency distribution of the cause of burn injury

Total	Silver sulfadiazine	Sesame oil	
191	91	100	Hot water
37	16	21	Hot Oil
76	43	33	Fire
12	7	5	tar/petrol, asphalt
24	14	10	Electrical sources
16	10	6	Contact injury
8	5	3	Others

191	91	100	Hot water
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24	14	10	Electrical sources
16	10	6	Contact injury
8	5	3	Others

Comparing the data between groups

The average age (p=<0.0001), the average size of burn area (p=0.0022), the frequency distribution of burn sites (p=0.350), cause of burn (p=.634) was not statistically different in 2 groups. The average first signs of healing time were 4.67±1.88 days in sesame group and 8.01±4.09 days in the silver sulfadiazine 1% cream group. The difference was statistically significant (p=0.00). Complete healing time in intervention group (12.06±1.86) was shorter than control group (15.12±3.91) and difference was statistically significant (p=0.00).

first sign of wound healing (day)	6.67±1.88	8.01±4.09	<0.0001
Complete healing time(day)	12.06±1.86	15.12±3.91	<0.0001

Discussion

The results of the present study showed that the healing time of patients suffering from second-degree burns using sesame oil were shorter than those treated with silver sulfadiazine 1% cream. Burn is one of the most common injuries that many people suffer from it. Different methods are applied to treat the burn. Evidences shows that burn can deeply affect patients' quality of life and disturb their physical, psychological, social and spiritual activity (23). The burn wounds would heal best in moist conditions. Moist condition prevented cellular dehydration. The best way to provide moist condition is the use of a topical medication or closed dressing to reduce fluid loss. Burn wound dressings serve three purposes They absorb drainage, They provide protection and a measure of isolation from the environment, They decrease wound pain [5]. Topical medications would control the pain, heal the wound faster and prevent wound infection and dryness (24). Treatment with SSD may slow wound healing and increases the frequency of dressing changes, resulting in increased pain. Modern membrane-like dressings may be superior to SSD, while honey, an ancient wound remedy, also appears to be an effective treatment.[6] A total of 30 RCTs are included in this review. Overall both the quality of trial reporting and trial conduct was generally poor and meta-analysis was largely precluded due to study heterogeneity or poor data reporting. In the context of this poor quality evidence, silver sulphadiazine (SSD) was consistently associated with poorer healing outcomes than biosynthetic (skin substitute) dressings, silver-containing dressings and silicon-coated dressings. Burns treated with hydrogel dressings appear to heal more quickly than those treated with usual care[]When compared to the controls, NF significantly improved wound contraction after day 10. Epithelialization time in the NF group was significantly faster than in the other groups (20 vs. 25.5 days) (P < 0.001). Histopathological and immunohistochemical findings confirmed the efficacy of the NF[13] Sesame is one of the oldest crops in the world which is mostly known as oil-rich edible seeds. Sesame seed contains 50-60% of high quality oil which is rich in polyunsaturated fatty acids (PUFA) and natural antioxidants, sesamin, sesamol and tocopherol homologues[30]. The antioxidant effects of sesame seeds have been used in treating wounds especially the burn injuries (25). The type of wound dressings is one of the effective factors in healing the burn injuries as wounds would heal faster in moist physiological environments and maintaining such condition would facilitate the healing process. Controlled wound moisture can provide favorable conditions for wound healing (26). The present study calculated the average healing time in patients who applied sesame oil to be shorter than in other patients. Dham et al.'s study reported 20 days of healing time for patients with second-degree burn injuries. The

final recovery point was complete epithelialization and complete functional recovery of organs such as hands and neck (27). A formulation of seeds and oil was prepared in carbopol at 2.5% and 5% concentrations and applied to the wounds. In the excision and burn wound models, the so treated animals showed significant reduction in period of epithelialization and wound contraction (50%). [14] The study conducted by Kiran et al. reported shorter epithelialization time in patients receiving sesame oil than those receiving aloe vera (28). Ebrahimi Fakhar et al. investigated the impact of sesame oil and calcium hydroxide on non-surgical closure of third-degree burn wounds in adult rats. The results of their study indicated that the wound closure timing had significantly reduced in patients who were receiving sesame oil and calcium hydroxide (22). MEBO is as effective as conventional management but is not the panacea for all burn wounds. The use of MEBO eases the management of face and neck burns and facilitates early institution of occupational therapy in hand burns. It confers better pain relief such that fewer opiates are used during the first 5 days after burn injury [15]. Generally, prostaglandins and thromboxane play key roles in generating inflammation following tissue injuries. So reducing the production of these compounds would also reduce the severity of inflammation. The anti-inflammatory activity of sesame oil is due to the presence of fatty acids that can replace arachidonic acid in cell membrane and subsequently reduce required substrate for these enzymes (29). Since sesame oil increases the natural process of wound healing, its appropriate application would reduce the appearance of scars especially when it is applied immediately after burn injury (27).

Conclusion

Topical Sesame oil can decrease the duration of wound healing of second degree burn

Recommendation

- 1- We recommend using sesame oil as an available, easy-to-use effective remedy for burns
- 2-research in multicentric and with more participants
- 3 research in children
- 4- Intervention in size.25%

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