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Assessing effect of three herbal medicines in second and third degree burns in rats and comparison with silver sulfadiazine ointment

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ARTICLE INFO

Article history:
Accepted 2 April 2014

Keywords:
Herbal medicines
Burn ointment
Animal model
Silver sulfadiazine

ABSTRACT

Introduction: Assessing effect of three herbal medicines on healing of deep second and third degree burns in rats and their comparison with silver sulfadiazine group.
Methods and materials: 40 rats were randomly assigned to one of the four groups, each group 10 rats. A deep second degree burn and a third degree burn were induced on the lower back and upper back of each rat under standard burning procedure, respectively. The burns were daily dressed with Robacin in group 1, silver sulfadiazine in group 2, aloe vera extract in group 3, and Rimojen in group 4. Responses to the treatment were assessed by digital photography during the treatment until day 32. Histological parameters (PMN, epithelialization, fibrosis, and angiogenesis) were assessed after the scar biopsy at the end of the research.
Results: On the basis of the taken photos, the wound had better healing in Robacin group. Also, speed of healing was better in aloe vera group than silver sulfadiazine and Rimojen groups. In terms of wound surface area maximal improvement was observed at the same time in the second and third degree burn wounds in Robacin group, in the second degree wound of aloe vera and Rimojen groups, and in the third degree wound of aloe vera and silver sulfadiazine groups. In pathological respects, epithelialization was more evident in both wounds of aloe vera group and third degree burn of Robacin group. In both wounds of Robacin group (second and third degree), the extend of angiogenesis and fibrosis was significantly less than other groups; but, inflammation was at a less level in third degree of silver, second degree of Rimogen and aloe vera, and third degree of aloe vera groups.
Conclusion: In histological survey, minimal rate of angiogenesis and fibrosis was seen in Robacin group, which indicated less wound scar in this group. Healing speed of the burn wound was also higher in Robacin group.

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http://dx.doi.org/10.1016/j.burns.2014.04.001

1. Introduction

Major burn is a particularly severe form of trauma characterized by a hypermetabolic state. A logical therapeutic approach for promoting recovery after burn would therefore be necessary to block the immediate triggering of the inflammatory cascades that result in prolonged metabolic imbalances. The second component of therapy would be to enhance wound healing [1].

Wound healing is widely discussed in the medical literature. Numerous works have been carried out to develop more sophisticated dressing that expedites the healing process and diminishes the bacterial burden in wounds. Traditional forms of medicine, especially the herbal products deployed for centuries in Africa and Asia, are under scientific investigation for their attributes in the wound treatment. Avicenna, the Persian physician and scholar (980–1037 AD), recommended medicinal plants for dressing wound in his famous book: Canon of Medicine [2]. Red Ginseng root extracts have also been used clinically as topical treatments for atopic suppurative dermatitis, wounds, and skin inflammation [3]. Kiwifruit which was originated more than 700 years ago in China was later introduced in New Zealand and California, where the first major planting occurred in 1960. Some clinical effects of kiwifruit ingredients such as ascorbic acid (as a scavenger), antibacterial agents, and actinidin (a potent protein-dissolving enzyme) have been reported in the literature [4].

Burn wound healing is one of the major indications of aloe vera gel use in many countries [5,9]. Clinical data on the treatment of psoriasis and lichen ruber planus have confirmed long-lasting ameliorative effects of BAC-3 (existing with high concentration in di-rhamnolipid) when compared to conventional therapy using corticosteroids [6].

Herbal products seem to possess moderate efficacy with no or less toxicity and are less expensive than synthetic drugs [7].

Spathodea campanulata Beauv. (Bignoniaceae) which is widely distributed throughout Africa and particularly found in Cameroon and Senegal is used in traditional herbal medicine for the treatment of ulcers, filaria, gonorrhea, diarrhea, and fever. S. *campanulata* was also known in Cameroon traditional medicine to have a healing activity in burn wounds [8].

Combudoron is composed of extracts from arnica and stinging nettleis and used for the treatment of partial thickness burns and insect bites in Europe. Nettle root extracts contain at least 18 phenolic compounds and 8 lignans [10]. Burn healing is still a challenge in modern medicine and there are a few drugs which could accelerate this process. As an alternative, plants have rich sources for investigations [11].

Traditionally, fresh leaves or decoction of *Chromolaenaodorata* have been long used throughout Vietnam as well as other tropical countries for the treatment of leech bite, soft tissue wounds, burn wounds, skin infection, and dento-alveolitis [12].

Combudoron also seems to have positive effects on healing grade 2 laser induced burns which deserve further investigation [13].

Swift eschar separation with a resulting wound-bed that appeared pink and viable suggests that kiwifruit may help in the management of patients with deep burns [14].

These data provided the motivation for designing an animal study for further randomized evaluation of some public herbal medicine used for burn wound in Iran; if the results of the study are encouraging, then a clinical trial can be done. In this study, two herbal medicines named Robacin and Rimojen and also extract of aloe vera leaves were compared with silver sulfadiazine (a synthetic burn ointment) for treating the induced second and third degree burn in rats. Robacin is a mixture of several herbal components including *Rosa damacena*, *Calendula officinlis*, and beeswax. Rimojen also is a mixture of thymus serpyllum, macrophyllum, and platonychium. Both of them have been used as a traditional burn ointment by conventional therapists and have reported good results; but, there are no scientific data to support their outcomes.

2. Materials and methods

In a randomized clinical trial, 40 Wistar-albino male rats (average weight: 300–350 g, average age: 3–4 months old) were randomly divided into 4 equal groups (1: topical Robacin treated group, 2: topical silver sulfadiazine treated group, 3: topical aloe vera group, and 4: topical Rimojen group). Robacin is composed of several herbal components including: *Rosa damacena*, *Calendula officinlis*, and beeswax. Rimojen also is a mixture of thymus serpyllum, macrophyllum and platonychium. One of the animals in silver sulfadiazine group and one in Robacin group died on the 8th day, thus 38 rats were remaining. All rats were sheltered in standard environment (temperature: 20–25 °C; humidity: 65–75%) under the supervision of a veterinarian. During the experimentation, the rats were fed with usual rat chow and tap water and each rat was kept in a separate cage. All the rats were handled according to the ethical principles for animal experiments of the international council for animal protection. All the experimental procedures were confirmed by the research ethics committee of the university. The rats were anesthetized with inhalational anesthesia using xylazine (10 mg/kg) and ketamine hydrochloride injection (50–100 mg/kg intramuscularly) was used to increase the depth of anesthesia. The skin on the dorsum was

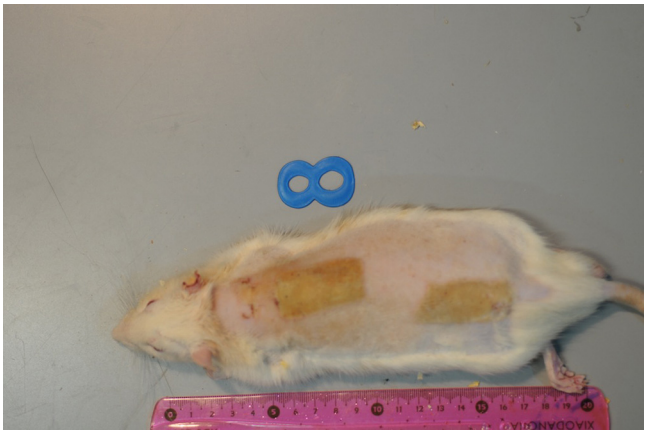

Fig. 1 – Third degree burn over the upper back and second degree burn over the lower back in the 2nd session (on the 4th day).