Research Article

COMPARATIVE EFFECT OF SODIUM FUSIDATE, FRAMYCETIN SULPHATE ON EXPERIMENTALLY INDUCED BURN WOUND HEALING

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ABSTRACT

Topical antibiotics like Sodium fusidate, Framycetin are used to treat burn wounds. But whether they influence healing of wounds is not known. The aim of the experiment to compare the effect of Sodium fusidate, Framycetin of Apex Laboratories Chennai, with that of available market preparations on experimentally induced burn wound healing in Wistar rats. Partial thickness burn wounds was inflicted, on Wistar rats under ketamine (50mg/kg/i.p), by pouring hot molten wax at 80° C into a metal cylinder of 300 mm^2 circular opening placed on shaven back of the rat. Animals with partial thickness burn wounds were divided into 7 groups (n=10). Group I did not receive any drug and served as control group. Group II, III, IV, V, VI and VII received topical creams of Sodium fusidate A, Sodium fusidate B, Fucidic acid, Framycetin A, Framycetin B, and Framycetin respectively, twice a day for 21 days or till complete healing whichever was earlier. Sodium fusidate B and Framycetin A significantly decreased the duration of epithelialisation and increased % of wound contraction in comparison to the control group. This was confirmed by histopathology studies. Sodium fusidate and Framycetin possess significant wound healing properties.

Keywords: Wound healing, Topical antibiotics, epithelialization.

INTRODUCTION

Burn can be defined as tissue damage caused by a variety of agents such as heat, chemicals, electricity, sunlight, or nuclear radiation. Burns are among the main causes of death of humans in the world, especially in developing countries despite advances in medical cares, infections are the major causes of death in patients with severe burn. Burn injury by itself and subsequent suppression of immune system predispose burn patients to infection with wide variety of microorganisms[1]. Most of the early treatment modalities include topical application of medicament, mainly aimed at preventing infection. Various topical agents such as sodium fusidate, framycetin, etc are used in burn wound patients. Whether these agents influence healing of burn wounds is not precisely known. Hence a study was planned to compare the effect of Sodium fusidate of different concentration A and B, Framycetin sulphate of different concentration A and B of Apex Laboratories Chennai, on experimentally induced burn wound healing in Wistar rats with available market preparation namely, Fucidic acid and Framycetin.

MATERIALS AND METHODS

Animals: Six month old healthy Wistar rats weighing 150-200g, bred locally in the animal house Manipal University, manipal, were selected for the study. They were housed under controlled conditions of temperature (23 ± 2°C), humidity (50 ± 5%) and 10-14 hours of light and dark cycles. The animals were housed individually in polypropylene cages containing sterile paddy husk (procured locally) as bedding and free access to food (animal chow) and water *ad libitum* was provided throughout the study. **Drugs**: Sodium fusidate A and B, Framycetin A and B and of Apex Laboratories Chennai, and available market preparations like Fucidic acid and Framycetin.

Methodology:

The study was conducted after obtaining approval from institutional animal ethical committee (IAEC/KMC/92/2009-2010). The rats weighing 150- 200 gm were selected for the study. Partial thickness burn wounds were inflicted, on all overnight starved Wistar rats (150-200 g) under ketamine (50mg/kg/i.p), by pouring hot molten wax at 80°C into a metal cylinder of 300 mm^2 circular opening placed on shaven back of the rat[2]. Wound contraction was monitored by measuring wound area, planimetrically, on the alternate days till the wounds were completely healed. Time taken for full-epithelialization was measured by recording the days required for fall of scab leaving no raw wound behind. Apart from the drugs under investigation no local/systemic chemotherapeutic cover was provided to animals. Animals showing signs of infection were excluded from the study and replaced with fresh animals. Animals with partial thickness burn wounds were divided into 7 groups (n=10). Group I did not receive any drug and served as control. , Group II, III, IV, V, VI, and VII received topical creams of Sodium fusidate A, Sodium fusidate B , Fucidic acid, Framycetin sulphate A , Framycetin sulphate B and Framycetin respectively twice a day for 21 days or till complete healing whichever was earlier.

Assessment of burn wound healing: Animals were inspected daily and the healing was assessed based on

the physical parameters like epithelialization period, wound contraction [3] and Histopathology examination.

a) Epithelialization period: It was monitored by noting the number of days required for the eschar to fall off from the burn wound surface without leaving a raw wound behind.

b) Wound contraction: It was assessed by noting the progressive changes in wound area planimetrically, excluding the day of wounding. The size of the wounds was traced on a transparent paper every two days, throughout the monitoring period. The tracing was then transferred to 1 mm^2 graph sheet, from which the wound surface area was evaluated. The evaluated surface area was then employed to calculate the percentage of wound contraction, taking the initial size of the wound, as 100%, by using the following equation:

$$\text{Percentage of wound contraction} = \frac{\text{Initial wound size} - \text{Specific day wound size}}{\text{Initial wound size}} \times 100$$

Histopathology: On day 16, some of the animals in each group were sacrificed and the wounds were excised together with the surrounding skin. They were fixed in 10% neutral buffered formalin. Histological examination was performed on hematoxylin and eosin stained 5-6µ thin paraffin sections of wound bed material.

Statistical analysis The results were analyzed using One-way ANOVA followed by Tuckey's *post hoc* test.

RESULTS

The mean period of epithelialization was found to decrease significantly in Sodium fusidate B, Fucidic acid and Framycetin B treated group ($P < 0.05$) when compared to control. The duration of epithelialization in the other treatment groups did not differ significantly when compared to control. The mean±SEM of the number of days required for epithelialization is shown in table 1

Table 1: Mean ±SEM of the duration of epithelialization in days

Sl. NO.	Groups	Mean ± SEM (days)
I	Control	23.00±0.44
II	Sodium fusidate A	21.80±0.20
III	Sodium fusidate B	**19.40±1.03***
IV	Fucidic acid	**18.20±0.46***
V	Framycetin A	19.80±1.17
VI	Framycetin B	**18.00±1.42***
VII	Framycetin	20.00±1.26

*P<0.05 in comparison to control

The percentage of burn wound contraction in the sodium Fusidate B and both Framycetin A and Framycetin B treated group was found to increase on the 4th day onwards. The percentage of wound contraction was significantly more in Sodium fusidate B treated groups on day 20 (p value <0.001), Framycetin A treated group on day 16 (p value – 0.019), day 20 (p value – 0.008) and Framycetin B treated group on day 20 (p value – 0.005) in comparison to the control groups.

In the present study Framycetin did not show any significant change in wound contraction in comparison to control. The mean ±SEM of the percentage of wound contraction of the various treatment groups on day 4, 8, 12, 16 and 20 have been shown in table 2.

Histopathological examination showed steady and progressive wound healing in the control group. Advanced healing with restoration of epithelium with high amount of collagen was seen in treated group.

Table 2: Mean ±SEM of the percentage of wound contraction on 4th, 8th, 12th, 16th and 20th day

Groups	4th day	8th day	12th day	16th day	20th day
Control	11.52±1.81	20.59±2.06	31.50±2.67	40.46±6.30	54.36±9.35
Sodium fusidate A	14.20±3.74	22.98±3.07	33.40±2.86	48.89±2.50	61.58±4.87
Sodium fusidate B	18.06±3.94	29.34±4.05	48.12±7.19	69.16±6.78	**96.98±3.01****
Fucidic acid	12.43±2.73	22.50±3.53	39.57±2.43	65.32±6.36	**100.00±00***
Framycetin A	22.180±4.6	38.48±5.64	53.53±5.71	**73.75±7.19****	**87.68±5.87***
Framycetin B	21.21±3.27	38.57±7.29	49.92±5.63	61.64±4.51	**88.80±4.59****
Framycetin	14.79±1.55	28.97±2.87	45.23±7.13	64.72±7.48	78.71±7.55

*P<0.05 ** p<0.001 in comparison to control

DISCUSSION AND CONSLUSION

Wound is a disruption in the continuity of the living tissues. Wound repair or regeneration or sometimes both lead to wound healing. The various phases of wound healing are inflammation, angiogenesis, epithelialization, collagenation, wound contraction etc. In the present study, Sodium fusidate significantly reduced the duration of epithelialization and increased the percentage of wound contraction[4]. This was substantiated by an increase in amount of collagen in Sodium fusidate and Framycetin A and B group on Histopathology study. Sodium fusidate and Framycetin of Apex laboratories have a biopolymer. Biopolymers are newer formulations aimed to improve drug pharmacokinetics. They have specific advantages since they are non toxic and biocompatible[5]. Hence in the present study Sodium

fusidate and Framycetin sulphate have promoted wound healing. This property can be made use of in chronic non healing ulcers or when healing of wound is delayed due to concomitant medications such as steroids, non steroidal anti-inflammatory drugs or anticancer drugs.

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