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COMPARATIVE EFFECT OF CALCIUM MUPIROCIN AND FLUTICASONE ON EXPERIMENTALLY INDUCED BURN WOUND HEALING IN RATS

Bairy KL [1], Pawan kumarA.V.[1] Avinash M Holla[1], Chandra Shekar BR[1], Lydia[2], Bhavya B, Satish Kumar MC[1]

[1]Department of Pharmacology, Kasturba Medical College, Manipal-576104, Udupi District, Karnataka, India
[2]Department of Anatomy, Kasturba Medical College, Manipal-576104, Udupi District, Karnataka, India

ABSTRACT: Topical antibiotic like Calcium mupirocin and its combination with steroid Fluticasone are commonly used to treat burn wounds. But whether they influence healing of wounds is not known.

Aim: To compare the effect of Calcium mupirocin and Fluticasone of Apex Laboratories Chennai, on experimentally induced burn wound healing in Wistar rats and compare with available market preparation Mupirocin and Fluticasone -mupirocin combination.

Method: Partial thickness burn wound 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 Calcium mupirocin A, Calcium mupirocin B, Mupirocin, Fluticasone+Calcium mupirocin A combination. Fluticasone +Calcium mupirocin B combination and Fluticasone -mupirocin combination creams respectively, twice a day for 21 days or till complete healing whichever was earlier.

Results: Calcium mupirocin significantly decreased the duration of epithelialization and increased % of wound contraction in comparison to the control group. This was confirmed by Histopathology studies.

Conclusion: Calcium mupirocin of apex possess significant wound healing properties.

Key words: Wound healing, Calcium mupirocin, epithelialization.

INTRODUCTION

Burn can be defined as tissue damage caused by a variety of agents such as heat, chemicals, electricity, sunlight, or nuclear radiation. Most burns only affect the skin (epidermal tissue and skin). Every year, about two million people receive medical treatment for burn injury [1]. Managing burns is important because they are common, painful and can result in disfiguring and disabling scarring, amputation of affected parts or death in severe cases. Most of the early treatment modalities include topical application of medicament, mainly aimed at preventing infection. Various topical agents such as Calcium mupirocin, Fluticasone, 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 calcium mupirocin of different concentration A and B, Fluticasone and Calcium mupirocin combination of different concentration A and B of Apex Laboratories Chennai, on experimentally induced burn wound healing in Wistar rats with available market preparation namely Mupirocin and Fluticasone -mupirocin combination.

MATERIALS AND METHODS

Animals: Six month old healthy Wistar rats weighing 150-200 g, 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**:** Calcium mupirocin A, Calcium mupirocin B, Mupirocin, Fluticasone + Calcium mupirocin combination A, Fluticasone + Calcium mupirocin combination B and Fluticasone -mupirocin combination.

Methodology:

The study was conducted after obtaining the approval of the Institutional Animal Ethical Committee (IAEC/KMC/92/2009-2010). Rats weighing 150-200 gms 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 epithelialisation 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. Group II,III, IV, V, VI and VII received topical creams of Calcium mupirocin A , Calcium mupirocin B, Mupirocin, Fluticasone+Calcium mupirocin A combination and Fluticasone +Calcium mupirocin B combination and Fluticasone -mupirocin combination 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 the 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:

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

c) 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 calcium mupirocin A and 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

Groups	Mean±SEM (days)
Control	23.00±0.44
Calcium mupirocin A	18.40±0.58*
Calcium mupirocin B	18.60±0.84*
Mupirocin	19.00±0.95
Fluticasone + Calcium mupirocin A	22.80±0.80
Fluticasone + Calcium mupirocin B	23.40±0.60
Fluticasone-Mupirocin combination	23.40±0.60

The percentage of burn wound contraction in the Calcium mupirocin A and Calcium mupirocin B treated group was found to increase on the 4 th day onwards. The percentage of wound contraction was significantly more in Calcium mupirocin A treated groups on day 20 (p value <0.001) and calcium mupirocin B treated group on day 12(p value – 0.011) day 16 (p value – 0.002) and on day 20 (p value – 0.001) in comparison to the control groups. 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.

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

Groups	4th day	8th day	12th day	16th day	20th day
1. Control	11.52±1.81	20.59±2.06	31.50±2.67	40.46±6.30	54.36±9.35
2.Calcium mupirocin A	8.20±2.16	15.46±1.81	26.66±2.68	55.25±7.13	100.00±00*
3.Calcium mupirocin B	17.07±3.63	40.61±4.71	57.33±4.29*	79.59±6.35*	95.09±3.28*
4. Mupirocin	16.46±3.89	26.63±4.73	42.34±4.40	67.21±8.72	93.45±5.08*
5. Fluticasone + Calcium mupirocin A	17.41±2.16	19.49±3.65	19.75±2.77	21.87±4.49	44.24±9.94
6. Fluticasone + Calcium mupirocin B	14.25±6.68	9.12±7.94	5.27±6.20	8.11±7.22	57.30±6.91
7.Fluticasone-Mupirocin combination	11.39±3.58	7.68±4.00	-1.09±3.44	-2.42±5.09	48.35±6.27

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

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.

DISCUSSION:

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 Calcium mupirocin significantly reduced the duration of epithelialization and increased the percentage of wound contraction [4]. This was substantiated by an in increase amount of collagen in Calcium mupirocin group on Histopathology study. Calcium mupirocin 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 Calcium mupirocin 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.

REFERENCES

1. Bingham HG, Hudson D, Popp J. A retrospective review of the burn intensive care admissions for a year. J Burn Care Rehabil 1995; 16:56-8.
2. Ramakrsihnan KM, Rao DK, Doss CR, Mathivanan T, Ma nokaran G et al. Incidence of burn wound sepsis in 600 burn patients treated in a developing country. Burns 1985; 11:404-07
3. Bairy KL, Somayaji SN, Rao CM. An experimental model to produce partial thickness burn wound. Indian J Exp Biol 1997; 35:70-2
4. Ethridge RT, Leong M, Phillips LG. Wound healing. In: Townsend MC, Beauchamp RD, Evers BM, Mattox KL, eds. Sabiston Textbook of Surgery : the biological basis of modern surgical practice. 18th ed: Saunders Elsevier, Philadelphia, 2007.
5. Chow D, Nunalee ML, Lim DW, Simnick AJ, Chilkoti A. Peptide based biopolymers in biomedicine and biotechnology. Mater Sci Eng R Rep 2008; 62:125-55.

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