

Effect of Topical Use of Heparin in the Treatment of Second-degree Burn in Children.

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Abstract

Introduction: Burn is a complex disease process, a trauma to physique as well as psyche. Visible disfigurement caused by burns translates into an altered pattern of socialization which in turn can have serious psychological ramifications. Patients with burns require immediate specialized care in order to minimize morbidity and mortality. So, the important part of the management of burns is wound management.

Objective: To assess the efficacy of topical heparin in burn wound management.

Methods: Prospective interventional study was carried out at the Department of Burn and Reconstructive Surgery, faculty of Paediatric Surgery, Bangladesh Shishu Hospital & Institute. A total 21 patients were included in this study after fulfillment of all selection criteria during the study period.

Result: The mean pain relief time, wound healing and hospital stay were 1.76 ± 0.54 days, 4.62 ± 0.86 days and 5.57 ± 0.75 days respectively.

Conclusion: Topical use of heparin is safe and effective in the treatment of second-degree burns in children.

Keywords: Topical heparin, second-degree burn, pain.

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I. Introduction

Burn injuries are common in children. It always occurs unexpectedly and have potential to cause death, Lifelong disfigurement and dysfunction¹. Burn is a complex disease process, a trauma to physique as well as psyche. Visible disfigurement caused by burns translates into an altered pattern of socialization which in turn can have serious psychological ramifications. Patients with burns require immediate specialized care in order to minimize morbidity and mortality². Second degree burn involves the epidermis and dermis. Accurate assessment of burn depth on admission is important in making a decision about dressings and surgery. The burn wound is a dynamic living environment that will alter depending on both intrinsic and extrinsic factors³. The breached skin barrier is the hallmark of thermal injury. Because of the importance of the skin as a barrier to microbial host invasion, it is not surprising that the risk of subsequent burn wound infection and systemic infection correlates with the size of the burn injury². Heparin has been used for improving tissues perfusion⁴. Heparin has been reported to be beneficial for burn related treatment since the 1950s. Burn patients treated with heparin in the acute stage of illness were observed to have clearer mental status, better urinary output, less morbidity and earlier healing⁵. Heparin is a multifaceted compound with anti-inflammatory, anti-allergic, anti-histaminic, anti-serotonin and anti-proteolytic enzyme properties. It has been used in both parenteral and topical form in the

management of thermal injuries to prevent burn extension, limit cutaneous tissue loss, promote faster healing with fewer contractures, relieves of pain, reduce tissue edema and weeping, prevent infection, and to promote neovascularization, granulation and re epithelialization of deeply burned tissue⁶.The aim of this study was to evaluate the effectiveness of topical heparin in respect of time taken for effective pain relief (faces scale), the time required for wound healing, wound infection and hospital stay in the management of second-degree burn in children.

II. Methodology & Materials

This was a prospective interventional study carried out at the department of Burn & Reconstructive Surgery, Faculty of Paediatric Surgery. Bangladesh Shishu Hospital & Institute. A total of 21 patients were included in this study from January 2021 to September 2021 after admission within 24 hours of burning up to 20% of body surface area. The exclusion criteria were any comorbidity, allergy to heparin and electric and chemical burns. After admission, each patient was thoroughly examined and investigated and all relevant information was noted. The guardian of the patient was informed about the treatment and informed written consent was obtained.

Sodium aqueous heparin solution was applied topically in diminishing doses until final healing. A total 20 ml of 5000 IU/ml of heparin solution was added to 500 ml of normal saline solution to make a 520 ml of 200 IU/ml concentrated heparin sodium solution. This diluted heparin solution was evenly dripped onto the open burn surfaces 3 times a day by 27 G needle connected via drip set to the drip containing heparin aqueous saline starting from day 1. Topical heparin in diminishing doses were continued until final healing. The total dose of heparin was 100,000 IU for each 15% second degree burn. So, each percentage of burn dripped with 34ml diluted heparin solution. The total dose was given in the first 2 days. The dose was reduced to 75% of day 1 on day 3 and 4 and to 50% up to final healing. Fifty percent of day 1 dose was initially dripped onto burn surfaces repeatedly in the first 10-15 minutes of heparin treatment and the rest 50% divided into two doses dripped 8 hourly².After discharge, each patient was followed up weekly for up to 4 weeks. On each follow-up healing, scar and itching were monitored. The statistical analysis was conducted using SPSS (Statistical Package for Social Science) version 26 statistical software.

III. Results

At the end of the follow-up, a total of 21 participants were included in the final data analysis. After completion of the data analysis, the results were organized in tabular form and figures. Figure (4-6) showed the effect of pre and post-results of the application of topical heparin.

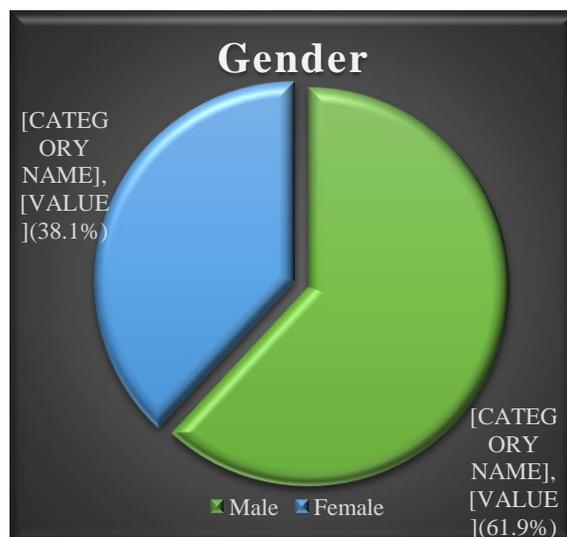


Fig. 1: Gender distribution of the participants(n=21).

Table I: Characteristics of the participants (n=21)

Characteristics	Mean±SD	Rang
Age (in months)	22.0±17.2	2-72
Weight (in kilograms)	10.1±2.3	4.75- 14.0
Percentage of burn	11.0±3.29	6.0 – 18.0

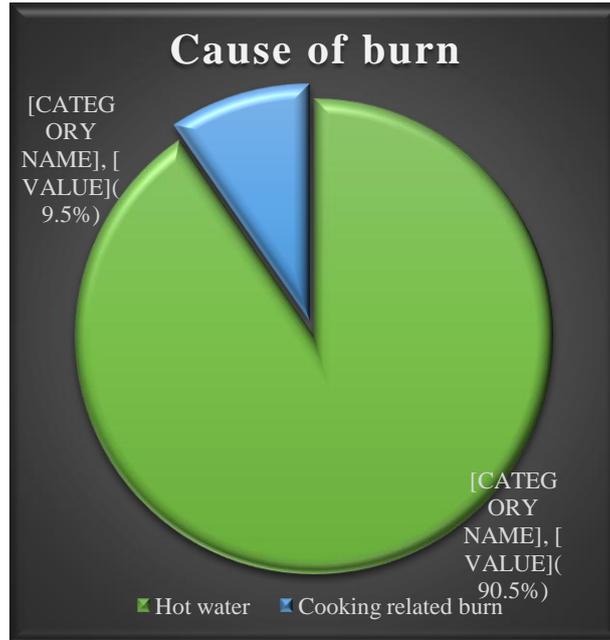


Fig. 2: Causes of the burn (n=21).

Table II: Outcome of variables (n=21).

Variables	Mean±SD	Range
Pain relief time (days)	1.76±0.54	1.0 -3.0
Wound healing time (days)	4.62±0.86	4.0-7.0
Hospital stay (days) Range	5.57±0.75	5.0 – 7.0

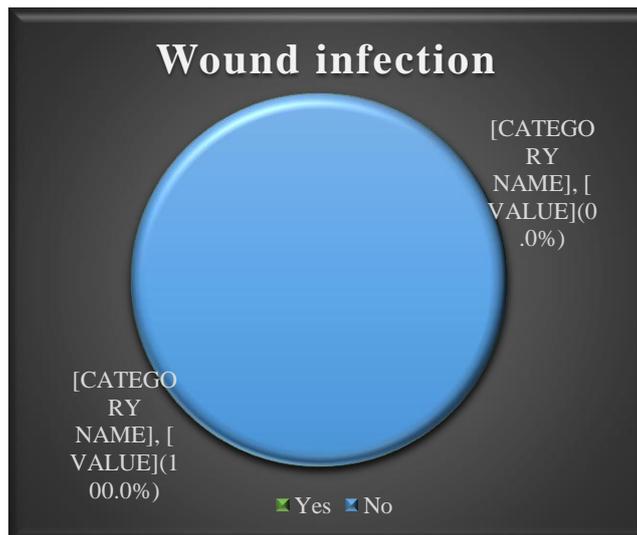


Fig. 3: Wound infection of the participants (n=21)



Fig. 4: Second-degree burn



Fig. 5: after 3 days



Fig. 6: After 7 days

IV. Discussion

Heparin safety has been demonstrated⁴. Multiple studies discussed the effect of topical heparin on the treatment of burns⁵⁻⁷. Pain relief effect: In our study, the mean pain relief time was 1.76 ± 0.54 days. It is due to its anti-inflammatory properties, heparin produces a dramatic reduction in pain, inflammatory edema and redness. Pain is assessed by a face scale. Pain is the most important parameter which restricts the patient's mobility and prolongs the duration of hospital stay⁶⁻¹². Jajra et al¹³ found that the mean pain relief time was 5.52 ± 0.98 days which was nearer to the present study. Wound healing time: In this study, the mean wound healing time was 4.62 ± 0.86 days which indicates faster healing. According to various studies^{6,7,10-12}, prolonged inflammation and stagnation of neutrophils are the characteristics of burn wounds. Secretory products of neutrophils are harmful to wound healing because they damage the extracellular matrix and growth factors. Heparin inhibits the action of these secretory elements by its electrostatic action. The revascularization makes the zone of stasis converted to the zone of hyperemia making the wound heal faster¹¹. Manzoor et al¹² observed that the mean wound healing time was 14 ± 1 days which was more than the present study. Wound infection: In the current study observed that no patients were found with wound infection. Heparin has anti-inflammatory activity. The mechanism of action includes influencing monocyte, T-cell and neutrophil activity, nitric oxide production, chemokine and cytokine activation and aggregation and smooth muscle cell proliferation¹⁴. Hospital stays: In this study, the mean hospital stay was 5.57 ± 0.75 days. According to various studies⁶⁻¹² heparin has the properties of effective pain relief and faster wound healing which all translated into the reduced duration of their hospital stay. Vijayakumar et al¹⁰ found that the mean length of hospital stay was 10.5 days. The study sample was small since it was undertaken during the COVID-19 pandemic. After discharge from the hospital, patients were followed up on weekly basis for up to 4 weeks. No patient had any sign of abnormal scar formation, itching, wound contracture or cosmetic disfiguration.

V. Conclusion

Topical use of heparin is safe and effective in the treatment of second-degree burns in children.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee.

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