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Topical Use of Heparin and Silver Sulfadiazine Cream in the Treatment of Second Degree Burn in Children: A Comparative Study

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Abstract **Original Research Article**

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. ***Objectives:*** To assess the efficacy of topical heparin and silver sulfadiazine cream in burn wound management. ***Methods:*** Prospective comparative interventional study was carried out at the Department of Burn & Reconstructive Surgery, Faculty of Paedicatric Surgery, Bangladesh Shishu Hospital and Institute. A total 42 patients were included in this study after fulfilment of all selection criteria during the study period. Patients were randomly selected into two groups. In group A (n=21) patients were treated with topical heparin and in group B (n=21) patients were treated with silver sulfadiazine cream. ***Results:*** The mean pain relief time was 1.76±0.54 days in group A and 5.52±0.98 days in group B. The difference was statistically significant ($p<0.05$). The mean wound healing time was 4.62±0.86 days in group A and 8.0±1.97 days in group B. The difference was statistically significant ($p<0.05$). The mean hospital stay was 5.57±0.75 days in group A and 8.10±1.97 days in group B. The difference was statistically significant ($p<0.05$). ***Conclusion:*** Topical use of heparin is safe and more effective than silver sulfadiazine cream in the management of second-degree burns in children.

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

INTRODUCTION

Burn injuries are common in children. It always occurs unexpectedly and has potential to cause death, lifelong disfigurement and dysfunction [1]. 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 [2]. 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 factors [3]. 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 injury [2]. From the practical point of view, the burn wound is better treated with dressings. There are many reported methods regarding the management of burn wounds. Open or exposure, semi-closed or closed techniques, with or without antibiotics, has all been advocated. The open method aims at drying up the burnt area as quickly as possible, leaving tissue to heal under a dry crust. The closed method usually entails an initial debridement under anaesthesia, application of topical antibiotic and cover

with some form of sterile dressing [4]. Silver sulfadiazine (SSD) has been commonly used in burn wound management since 1968 to try to overcome the problem of wound infection. The traditional idea that silver sulfadiazine cream is the product of choice for burns is still a reality. But it has rare serious side effects including sensitivity, hemolytic anemia, leukopenia and bacterial resistance [5]. In this regard, heparin has been introduced because of its role in burn wound management. Multiple mechanisms explain the role of heparin in burns when used topically. Firstly, heparin has anti-inflammatory activity. The mechanism of action includes influencing monocyte, T-cell and neutrophil activity, nitric oxide production, chemokine and cytokine activity, complement activity, platelet activation and aggregation, and smooth muscle cell proliferation. Second, heparin restores blood flow in a shorter time and revascularizes ischemic tissue, through enhanced vascular growth. The mechanisms of this action are the inhibition of selectin mediate cell-cell interaction, heparinase inhibition, binding of proangiogenic growth factors and stimulation of tissue factor pathway inhibitor release. Third, wound healing is affected by enzymes such as elastase, cathepsin G, and proteinases, which degrade the extracellular matrix, growth factors and further recruit neutrophils to the wound area. Heparin inhibits the function of these cells through electrostatic interactions and enhances healing [2]. The aim of this study was to compare the effectiveness of topical heparin with silver sulfadiazine cream in the management of second degree burn in children.

METHODOLOGY & MATERIALS

This was a prospective comparative interventional study carried out on patient who admitted with second degree burn within 24 hours at Bangladesh Shishu Hospital & Institute, from December 2020 to November 2021. Total 42 patients were included in this study up to 20% body surface area burn. The patient with any comorbidity, known allergy to heparin and SSD and electric and chemical burns were excluded from the study. They were randomly assigned to heparin group (Group A=21) and silver sulfadiazine (Group B = 21). The comparative parameters between two groups were time taken for effective pain relief (faces scale), time required for wound healing, wound infection and length of hospital stay. After discharge each patient was followed up weekly upto 1 month and each follow up healing, scar and itching were monitored. The statistical analysis was conducted using SPSS (Statistical Package for Social Science) version 26.0 statistical software. The student t-test and Mann Whitney U test were used to compare the continuous variables. Pearson's Chi-square test was used to compare categorical variables. A p value of <0.05 was considered significant.

Heparin administration: 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 was 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 hourly[2]. Silver sulfadiazine cream application: Burn wound was washed out with sterile normal saline and application of 1% silver sulfadiazine cream twice daily till complete healing.

RESULTS

At the end of follow up, a total of 21 participants in each group were included in the final data analysis. After completion of the data analysis, the results were organized in the tabular form (Table I and II). Figures (1-4) showed the comparison between pre and post results of the two groups patients.

Table I: Characteristics of the participants between two groups (n=42)

Characteristics	Group A (n=21)	Group B (n=21)	P value
Age (in months) Range	22.0±17.2 (2-72)	34.9±34.3 (5-138)	0.268
Gender			
Male	13(61.9%)	12(57.1%)	0.753
Female	8(38.1%)	9(42.9%)	
Weight (in kilograms) Range	10.1±2.3 (4.75- 14.0)	13.9±9.8 (5.0 - 40.0)	0.094
Cause of burn			
Hot water	19(90.5%)	20(95.2%)	0.549
Cooking related burn	2(9.5%)	1(4.8%)	
Percentage of burn Range	11.0±3.29 (6.0 – 18.0)	9.71±3.32 (5.0 – 18.0)	0.214

Table II: Comparison of variables between two groups (n=42)

Variables	Group A (n=21)	Group B (n=21)	P value
Pain relief time (days) Range	1.76±0.54 (1.0 -3.0)	5.52±0.98 (4.0-7.0)	<0.001
Wound healing time (days) Range	4.62±0.86 (4.0-7.0)	8.0±1.97 (5.0-14.0)	<0.001
Wound infection	0(0.0%)	1(4.8%)	0.311
Hospital stay (days) Range	5.57±0.75 (5.0 – 7.0)	8.10±1.97 (6.0 – 14.0)	<0.001

Fig. 1: Second-degree burn

Fig. 2: After 5 days of heparin administration

Fig. 3: Second-degree burn

Fig. 4: After 10 days of SSD cream application

DISCUSSION

A prospective study was conducted at the department of Burn and Reconstructive Surgery, Faculty of Paedicatric Surgery, Bangladesh Shishu Hospital & Institute, Dhaka from December 2020 to November 2021 to compare the outcome between topical use of heparin and silver sulfadiazine cream for the management of second-degree burn in children. A total of 42 patients who fulfilled the selection criteria within the assigned time were enrolled in the study. 21 participants were included in group A (Heparin group) and 21 participants were included in group B (Silver sulfadiazine group) after randomization. In this study, the independent variables were age, sex and body weight, percentage of burn and causes of burn. These variables were not statistically significant between the two groups. So, they did not have any effect on the outcome of the dependent variables. This study showed that the mean pain relief time between the two groups was statistically significant. It is due to its anti-inflammatory properties, it produces a dramatic reduction in pain, inflammatory edema and redness. Patil *et al.,* [6], Hamza *et al.,* [7] Jajra *et al.,* [8] and Gupta *et al.,* [9] found significantly reduced pain in the heparin group than the control group. In our study, the mean wound healing time between the two groups was statistically significant. Heparin has been shown to modulate several phases of wound healing. It has a chemotactic effect on endothelial cells, with resultant stimulation neovascularization and improvement of blood circulation subjacent to the burn [10]. Heparin has been shown to increase the survival of deeper layers of skin through its vasodilatory and antithrombin effects. Furthermore, epithelization by the proliferation of these surviving de- epithelized island cells is induced with heparin thus making superficial and deep burns heal in a shorter period of time [11, 12]. Manzoor *et al.,* [13] also found similar results. In current study observed that no (0%) patient was found with wound infection in group A and 1(4.8%) patient was found with wound infection in group B. The difference was not statistically significant ($p>0.05$) between the two groups. Both groups were treated with injectable antibiotics for five days followed by an oral antibiotic. The finding was incidental. Barretto *et al.,* [14] stated that there was no difference in the incidence of wound infection. One wound infection was caused by Staphylococcus aureus. The Antibiotic was changed according to the C/S report. In this study, the mean hospital stay between the two groups was statistically significant. Masoud *et al.,* [2] also found the same result. The patients in the heparin group had an improved outcome compared with the patients in the control group with respect to reducing pain and tissue edema which all translated into the reduced duration of their hospital stay. But Vijayakumar *et al.,* [15] found that the difference was not statistically significant between the two groups. 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 up to 4 weeks. No patient had any sign of abnormal scar formation, itching, wound contracture or cosmetic disfiguration.

CONCLUSION

Topical use of heparin is safe and more effective than silver sulfadiazine cream in the management 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.

REFERENCES

1. Okeniyi, J. A. O., Olubanjo, O. O., Ogunlesi, T. A., Oyelami, O. A., & Adesunkanmi, A. R. K. (2005). Healing of burns in children: which is the better agent, honey or silver sulphadiazine?. *Nigerian journal of paediatrics*, *32*(1), 7-11.
2. Masoud, M., Wani, A. H., & Darzi, M. A. (2014). Topical heparin versus conventional treatment in acute burns: a comparative study. *Indian Journal of Burns*, *22*(1), 43-50.
3. Papini, R. (2004). Management of burn injuries of various depths. *Bmj*, *329*(7458), 158-160.
4. Gosselin, R. A., & Kuppers, B. (2008). Open versus closed management of burn wounds in a low-income developing country. *Burns*, *34*(5), 644-647.
5. Miller, A. C., Rashid, R. M., Falzon, L., Elamin, E. M., & Zehtabchi, S. (2012). Silver sulfadiazine for the treatment of partial-thickness burns and venous stasis ulcers. *Journal of the American Academy of Dermatology*, *66*(5), e159-e165.
6. Patil, A. V., Mohan, P. K., Ritesh, G. V., Kotennavar, M. S., & Rathod, S. (2019). Topical heparin: a better sanative for burns patient than conventional treatment. *Journal of Krishna Institute of Medical Sciences University*, 8(4), 42-9.
7. Hamza, F. A., Salim, A. A., & Rizk, H. N. (2020). Evaluation of the Effect of Topical Heparin on the Treatment of Facial Burn. *Al-Azhar International Medical Journal*, 1(2), 198-202.
8. Jajra, D., Lodha, S., Kumar, A., Jakhar, D. S., & Singh, J. (2020). Role of Topical Heparin in Treatment of Burn at Tertiary Care Hospital in Western Rajasthan. *Academia Journal of Surgery*, 3(1), 110-5.
9. Gupta, A., Verghese, T. J., Gupta, P., & Gupta, A. K. (2015). Role of topical heparin in the management of burns: experience in a district government hospital of Karnataka in South India. *Plastic and Aesthetic Research*, 2(3), 111-4.

10. Schwartz, R. A., & Al Mutairi, N. (2010). Topical antibiotics in dermatology: An update. *GJDV*, 17(1), 1-19.
11. Ravikumar, T., Shanmugasundaram, N., Jayaraman, V., Ramakrishnan, K. M., & Babu, M. (2006). Low molecular weight heparin-induced pharmacological modulation of burn wound healing. *Annals of Burns and Fire Disasters*, 19(3), 123-9.
12. Agbenorku, P., Fugar, S., Akpaloo, J., Hoyte-Williams, P. E., Alhassan, Z., & Agyei, F. (2013). Management of severe burn injuries with topical heparin: the first evidence-based study in Ghana. *International journal of burns and trauma*, 3(1), 30-6.
13. Manzoor, S., Khan, F. A., Muhammad, S., Qayyum, R., Muhammad, I., Nazir, U., & Bashir, M. M. (2019). Comparative study of conventional and topical heparin treatment in second degree burn patients for burn analgesia and wound healing. *Burns*, 45(2), 379-86.
14. Barretto, M. G., Costa, M. D., Serra, M. C., Afiune, J. B., Praxedes, H. E., & Pagani, E. (2010). Comparative study of conventional and topical heparin treatments for burns analgesia. *Revista da Associação Médica Brasileira*, 56(1), 51-5.
15. Vijayakumar, C., Prabhu, R., Velan, M. S., Krishnan, V. M., Kalaiarasi, R., & Swetha, T. (2018). Role of Heparin Irrigation in the Management of Superficial Burns with Special Reference to Pain Relief and Wound Healing: A Pilot Study. *Cureus*, 10(8), e3157.