Original research article

The Potency of Tropical Heparin Spray Therapy in A Tertiary Referral Centre for Second Degree Thermal Burns

Sanjay Kumar Gupta[1], Shinde Sagar Sambhaji[2], Ashutosh Shankhdhar[3]

[1]Associate Professor, Department of Plastic Surgery, Patna Medical College, Patna, Bihar, India[1]

[2]MCH Resident I, Department of Plastic Surgery, Patna Medical College, Patna, Bihar, India[2]

[3] MCH IIIrd yr Resident, Department of Plastic Surgery, Patna Medical College, Patna, Bihar, India

Corresponding Author: Ashutosh Shankhdhar

Abstract

Introduction: Numerous innovative medications are being used to treat burn victims' pain, lessen scarring, and enhance their overall prognosis. Heparin has been used in this context due to its involvement in the management of burn wounds being scientifically established. The goal was to determine whether the addition of heparin, applied just topically, may enhance the therapy of burns.

Method: 60 patients with 11-21% burns each was randomly assigned to the heparin group (H-group) (30) or the control group (C-group) in this study (30).

Result: From the first week on, only patients in the H-group were given analgesics on demand. In contrast, 34% of patients in the C-group received a twice-daily dose of analgesics during the first week of their treatment. Patients in the H-group had an average hospital stay of 12.2 days as opposed to the 18.2 days it took the C-group patients on average ($P < 0.04$).

Conclusion: According to the current research project, heparin significantly reduces the need for analgesics and the amount of time needed to prepare a burn lesion for grafting. Heparin also appears to be more affordable than silver sulfadiazine dressings.

Keyword: Burn, conventional burn treatment, topical heparin

Introduction

Burn is a complicated illness process that causes both physical and psychological distress. Burns that produce visible disfigurement result in changed socialisation patterns, which might have negative psychological effects. When handling these patients, a health care professional should keep in mind the following crucial factors: pain, extended hospital stays, lost workdays, and drain on financial resources. Many of these points are relevant to burn care in underdeveloped nations. To reduce morbidity and death, patients with burns require urgent expert care [1].

Thermal damage is characterised by the break of the skin barrier. It is not unexpected that the likelihood of recurrent burn wound infection and systemic infection corresponds with the size of the burn damage given the significance of the skin as a barrier to microbial host invasion [2-4]. A protracted and subsequently dysregulated inflammatory phase, an imbalance between pro- and anti-fibrogenic molecules, and the participation of particular cell subpopulations are causal variables that are connected to the creation of pathological scars [5].

Numerous innovative medications are being used to treat burn victims' pain, lessen scarring, and enhance their overall prognosis. This alone demonstrates the inadequate response to traditional therapeutic techniques. Heparin has been used in this context due to its involvement in the management of burn wounds being scientifically established. There are two different forms of heparin: Low-molecular-weight heparin (LWMH) is a mixture of smaller polymers with weights ranging from 2000 to 15,000 kDa, whereas unfractionated heparin (UFH) is a mixture of saccharide polymers with weights ranging from around 5000 to 30,000 kDa [6].

The role of heparin in burns when applied topically is explained by a number of processes. First, the antiinflammatory properties of heparin may contribute to its therapeutic effect. Many factors that cause inflammation may be directly or indirectly mediated by the effects [7].

The mechanism of action may also affect platelet activation and aggregation, complement activity, monocyte, T-cell, and neutrophil activity, nitric oxide production, chemokine and cytokine activity, and smooth muscle cell proliferation [8].

Second, by promoting vascular development, heparin can speed up the restoration of blood flow and revascularize ischemic tissue [9]. Selectin-mediated cell-cell contacts, heparinase inhibition, binding of proangiogenic growth factors, and stimulation of tissue factor pathway inhibitor release are examples of possible mechanisms for this effect. [10] Thirdly, the extracellular matrix, growth hormones, and proteinases such as elastase, cathepsin G, and proteinases that further draw neutrophils to the wound site have an impact on wound healing. Through electrostatic interactions, heparin and related chemicals may prevent these cells from functioning and promote healing [11,12].

METHOD:

The Patna Medical College, Patna conducted this randomised control research from 1 September 2020 to 30 October 2021. The study involved 60 consecutive burn patients with burns covering 11-21% of the total body surface area (TBSA).

In this study, patients were divided into two groups at random, with different patients being placed in each group on a regular basis. 30 patients made up the study group, known as the "heparin group" (H-group), and 30 patients made up the "control group," or C-group. 30 patients made up the study group, known as the "heparin group" (H-group), and 30 patients made up the "control group," or C-group. Every time, a new solution was made. Starting on day 1, this diluted heparin solution was uniformly dripped or sprayed onto the exposed burn sites 2-3 times per day. Until full healing, topical heparin in decreasing doses was used.

Statistic evaluation

Fisher's exact test and the Student's t-test were used for data analysis.

Follow-up

Patients were followed up according to the following schedule after leaving the unit: Weekly in the second month; after every one week in the third month; and subsequently, every three months

RESULT:

In this investigation, the majority of the patients suffered second and third-degree burns. Only 6% of patients in either group had third-degree burns, while 94% of patients in both groups had second-degree burns [Table 1].

Table 1: Severity of Burns

Degree of burn	Heparin group		Control group	
	Number	Percentage	Number	Percentage
Second-degree superficial	**6**	**24%**	**5**	**20%**
Second-degree deep	**20**	**70%**	**21**	**74%**
Third degree	**4**	**6%**	**4**	**6%**

From the start of the first week, all of the patients in the heparin group were only receiving "on-demand analgesics". On-demand, analgesia was required for 54% of control group patients and OD analgesics from the first week in 19% of cases. A skin transplant was required for 29% of the patients, of whom 9% were from the Heparin group and 19% from the control group. After eschar separation, the average time needed to prepare a wound for skin grafting was 6 days in the heparin group, compared to 10 days in the control group. The maximum hospital stay for the Heparin group was 4 weeks, while it was 6 weeks for the control group. It was noted that the average hospital stay in the Heparin group was 12.2 days as opposed to the control group's 18.2 days on average. In the Heparin group, 9% of patients experienced hypertrophic scarring, compared to 19% in the control group.

In the Heparin group, 4% of patients and 9% of patients in the control group required prolonged antibiotic administration for more than 2 weeks [Table 2].

Table 2: Requirement of Antibiotics

Starting from 4^{th} day after obtaining cultures	Heparin group		Control group	
	Number	Percentage	Number	Percentage
4-8	**17**	**65%**	**6**	**25%**
4-15	**7**	**25%**	**20**	**60%**
4-20	**6**	**10%**	**4**	**15%**

The cost difference between the heparin and control groups was on average 1990 rupees per day for each patient. Analysis of the average cost over the course of treatment showed a 170 rupee difference in cost across the groups, with heparin dressings being the less expensive option. Periodic scans of patients in the heparin group and the control group showed that the heparin group saw quicker healing and fewer issues from scars.

DISCUSSION:

A requirement for analgesia

A startling finding from our research was that starting in the first week, only patients in the H-group were receiving analgesics on demand. In contrast, in the C-group, in the second week of treatment, 34% of patients received B.D. dosages of analgesics and 44% received O.D. dosages ($P < 0.04$). These results are in line with recent burn studies' observations, as demonstrated by the findings of Agbenorku et al. [13], who discovered that heparin is useful for pain relief. In a similar vein, Ferreira Chacon et al. [14] found that patients with superficial second-degree burns experienced less discomfort after receiving a topical heparin spray application.

In our study, subjective findings such a decrease in erythema and edoema were noted in addition to pain relief. The results mentioned above show that heparin has the anti-inflammatory properties that have been noted in numerous earlier investigations. Less analgesic problems in the H-group was an additional benefit of the reduction in analgesic requirements.

Skin grafts

10% of the 29% of patients in our total series who required skin grafting belonged to the H-group, and 19% to the C-group (P <0.04). According to Srivastava et al.,[15] heparin-treated patients' superficial and deep burns healed in a record amount of time. These findings are supported by the literature because heparin's vasodilatory and antithrombin actions allowed the skin adnexal components in the deeper layers of skin to survive. Heparin induces epithelization through the multiplication of these remaining de-epithelized island cells, hastening the healing of both superficial and profound burns.

Length of stay in the hospital

In the H-group, 34% of patients spent an average of two weeks in the hospital, whereas in the C-group, the same number of patients stayed for an average of three weeks (P = 0.04). According to Agbenorku et al.,[13], the H-group experienced a decrease in the amount of time patients spent on admission. A shorter hospital stay results from improved outcomes in H-group patients compared to the C-group, including less discomfort, decreased need for antibiotics, decreased need for skin grafts, and decreased graft loss. A shorter hospital stay translates into an earlier return to work in our region of the country, where the majority of our patients are from the low socioeconomic working class. In addition to hastening the patient's return to society, it also benefits hospital administration by reducing bed occupancy and freeing up space for additional patients.

Problems with wound healing

Wound healing issues in the form of hypertrophic scarring occurred in about 9% of patients from the H-group and 19% from the C-group (P < 0.04). Our findings are consistent with the literature because Venakatachalapathy et al. [16]. comparative analysis found that the H-group patients had better-looking new skin overall. Heparin speeds up collagen production and deposition in the beginning and slows it down and absorbs it in the second phase, which tends to limit fibrin buildup and scar development.

Demand for antibiotics

When we compared the usage of antibiotics between the study and control groups, we discovered that 44% of patients in the H-group required 1-2 weeks of antibiotic treatment, whereas 59% of patients in the C-group required the same treatment (P > 0.04). The results of the blood and wound swab cultures in the two groups did not differ substantially. Additionally, there was no discernible difference between the separated organisms and their medication sensitivity. The administration of antibiotics was kept up until clinical indicators improved.

According to Venakatachalapathy et al.,[16] individuals using topical heparin needed less antibiotics. One theory is that heparin's neo angiogenic properties promote increased blood flow to ischemic regions, which in turn improves the delivery of antibiotics to burned areas.

Side-effects

In the course of our research, we came across no instances where topical heparin had a negative effect. Patients in the H-group had subjective examination for severe burn wound bleeding, epistaxis, hemoptysis, and hematuria. In addition, a routine lab evaluation of the coagulation profile, a urine

test, and a stool screening for hidden blood were all included in the objective assessment. Heparin-allergic patients were not allowed to participate in the trial. The use of a diluted heparin solution and a lack of considerable absorption appear to be the causes.

CONCLUSION:

Heparin reduces the need for analgesics and the amount of time needed to prepare a burn lesion for grafting after eschar separation, as shown by the current comparative investigation. Additionally, by reducing hospital stays and wound complications such hypertrophic scarring, it also appears to have a good impact on quality of life metrics.

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