

## Evaluation of the Effect of Topical Heparin on the Treatment of Facial Burn

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### Abstract

**Background:** Burn is a complex disease process; visible disfigurement caused by burns translates into an altered pattern of socialization which can have serious psychological ramifications.

**Objectives:** The aim of this work was to evaluate the efficacy of topical heparin on the treatment of facial burn regarding pain relief, antibiotic requirements and healing time.

**Patients and Methods:** This is a prospective controlled random study. That included 40 patients, 15-60 years of age, males and females having acute thermal burn up to 20% TBSA including the face, They were subjected either to dressing with topical heparin or topical anti-microbial creams. This study was done at the burn unit and clinic of the department of plastic and Burn surgery at Al-Azhar University Hospitals and El Salalm Specialized Hospital.

**Results:** The use of heparin in burns has been shown to maintain blood circulation, relieve pain, limit inflammation, re-vascularize ischemic tissue, enhance granulation, regulate collagen, and reduce scarring and contractures. The patients dressed with topical heparin suffered less pain and required less analgesics and fewer antibiotics, no-hard dressings, and less secondary procedures; early returned home and work with little psychological ramifications, costs also were lower than in the control group.

**Conclusion:** Our study showed that in patients with facial burns of thermal etiology, the use of topical heparin significantly reduces pain and edema, enhances faster healing and epithelialization and requires less antibiotics

**Keywords:** Topical Heparin; Facial; Burn; Evaluation.

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## INTRODUCTION

Heparin has been used for improving tissues perfusion<sup>1</sup>. Heparin has been reported to be beneficial for burn-related treatment since the 1950s. Green et al indicated that 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 healing<sup>2</sup>.

Heparin is a multifaceted compound with anti-inflammatory, anti-allergenic, anti-histaminic, anti-serotonin and anti-proteolytic enzyme properties. It has been used in both parenteral and topical forms in the management of thermal injuries to prevent burn extension, limit cutaneous tissue loss, promote faster healing with fewer contractures, relieve of pain, reduce tissue edema and weeping, prevent infection, and to promote revascularization, granulation and re-epithelialization of deeply burned tissue<sup>3</sup>.

Burns of face and neck have been treated with open topical ointments. Burns of face and neck need special care because of possible damage to air way, ear cartilage and eye. A number of studies suggest that heparin reduce the healing time of burn leading to better quality scarring<sup>4</sup>.

Heparin has been reported to be of value. The routes of heparin administration described are topical, intravenous, subcutaneous, inhalation, and in membranes. The largest and longest use of heparin was by topical application<sup>1</sup>.

In this thesis we evaluate the effect of topical heparin on the treatment of facial burn in comparison with traditional treatment.

## PATIENTS AND METHODS

This is a prospective controlled random study, done at the burn unit and clinic of the department of plastic and Burn surgery at Al-Azhar University Hospitals and El Salalm Specialized Hospital. The burn unit for *in patients* and the clinic for *out patients* and follow up visits after hospital discharge.

Forty consecutive patients -either males or females-, ranging from 15-60 years old, with acute thermal burn up to 20% body surface area burn including the face, either it was superficial partial, deep partial or full thickness were selected and followed up at the period from April 2019 to September 2019, The forty patients were divided into two similar twenty patients groups; Heparin group was treated with diluted topical heparin drip and Control group which treated with topical antimicrobial creams.

Patients with contraindication to the use of heparin like liver disease, renal disorders, blood coagulating diathesis, an allergy to heparin, active peptic ulcer, thrombocytopenia, electrical and chemical burns, active or potential bleeding due to trauma and extensive, fatal or old burns were excluded.

Results of both groups were compared with various variables to know the effectiveness of topical heparin dressing on acute facial burn regarding pain relief, antibiotic requirements and healing time. All patients were subjected to full history taking, general and local examination and laboratory investigations.

All patients of both groups were followed up weekly in the first month, one month, two months and three months later. Either they were inpatients or out patients. Daily dressing of wounds was done, medical photography for each follow up visit.

The need for analgesia and visual analog pain scale (VAS) were calculated for all patients to evaluate the analgesic effect of topical heparin and to adjust the analgesic dose to each group; Clinical healing time was evaluated to patients all through time of hospital stay and upon discharge by clinical assessment and time of wound healing at each follow up visit. Also, routine laboratory investigations (CBC, SGOT, SGPT, etc) and coagulation profile (PT, PTT, INR) were done to the admitted cases to assess patients and monitor heparin effect, wound culture swabs were taken to follow up the rate of infection and treat it according to culture results.

Burn blisters, were ruptured, and the burn wound was cleansed with normal saline, The total day one topical heparin dose is about 100,000 IU /15% TBSA in two or three divided doses, more initially and less lately. As the face accounts for about 4.5% BSA, we placed 2 to 8 milliliters of the 5000 IU/ml heparin according to burned surface area, in a 20ml syringe with 28 gauge needle attached, the calculated dose of topical heparin was diluted 1:1 or 1:2 with normal saline and dripped on to the burn surface. Approximately, 50% or more of day one dose was initially dripped on to the burn surfaces repeatedly in the first 10-15 min of heparin treatment, until the patient report that the burn pain has been relieved, and the initial burn erythema has blanched and the burn surface was dressed with normal saline in between to keep it moist. Day two and beyond, Topical use of heparin on healing burn surfaces was repeated four times daily using diminishing dose and duration until only a few drops are used in the final healing phase.

The patients were informed of the study and after this signed a consent term of their participation, after explanation of possible complications, ethical and legal implications.

To compare the effect of each dressing method on the clinical outcome these criteria and signs were observed and documented during follow up. Data collected, revised, coded and entered to the Statistical Package for Social Science (IBM SPSS) version 23. The quantitative data were presented as mean, standard deviations and ranges when their distribution found parametric and median with inter-quartile range (IQR) when their distribution found non parametric.

**RESULTS**

The patients in Heparin group reported less pain scores which means more satisfaction and comfortableness and less requirements of analgesics (Doses & Numbers) with topical heparin dressing than patients in Control group.

Also, Healing time which is the time that burn injury take to get rid of dead tissues and make neo-epithelilization, was calculated per week for all patients on each group. The number of healed cases per week in Heparin group was more than those in Control group. Figures (2- 9) show the comparison between the pre and post results of the two group’s patients.

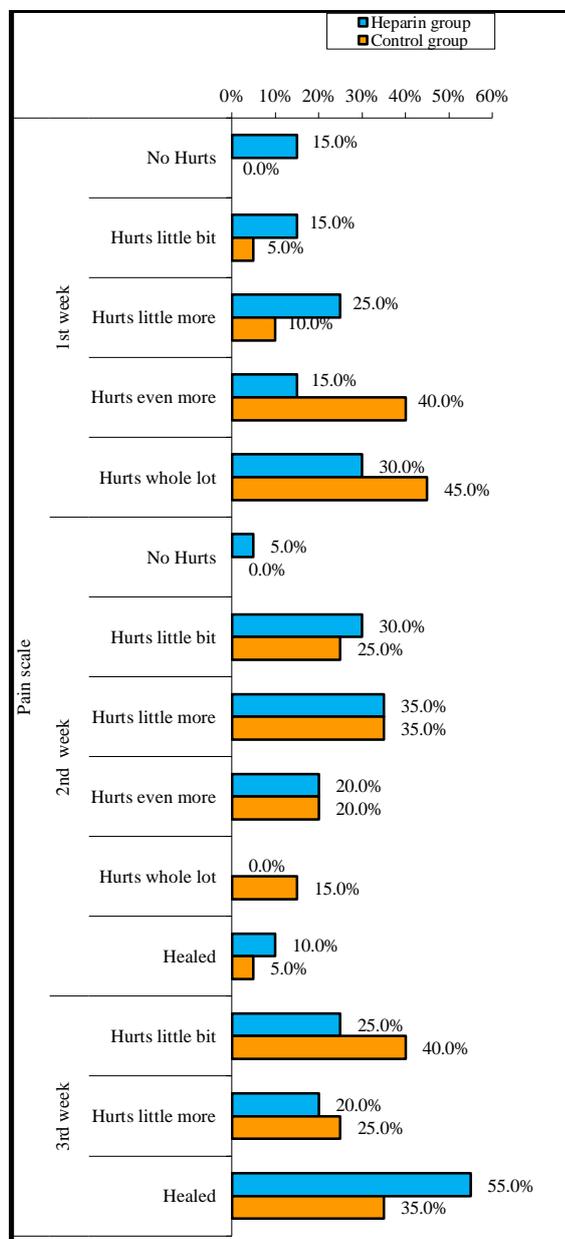


Figure 1: Pain scale and percentage of healed patients in each group per week.



**Fig. 2:** 28 year's old pt. with deep Partial thickness burn



**Fig. 4:** 28 year's old pt. with deep Partial thickness burn



**Fig.3:** After two weeks of topical heparin dressing.



**Fig.5:** After two weeks of topical antimicrobial creams.



**Fig.6:** 19 years old pt with superficial and partial thickness burn



**Fig.8:** 21 years old pt. with superficial Partial thickness



**Fig.7:** After one week of topical heparin dressing.



**Fig.9:** After one week of topical antimicrobial creams.

### DISCUSSION

Heparin safety has been demonstrated<sup>1</sup>. Multiple studies discussed the effect of topical heparin on the treatment of acute burns, here we will discuss the results of our study in comparison with the other studies<sup>2,3,4,5</sup>.

Analgesic effect: Multiple studies found that The heparin study group reported less pain while consuming less analgesic medication, as compared to the patients treated with the conventional dressing, On explanation, they reported that Due to its anti- inflammatory properties, heparin produces a dramatic reduction in pain, inflammatory edema, and redness. Pain is

Fawzy et al Heparin in burns

assessed by VAS. Pain is the most important parameter which restricts the patient's mobility and prolongs the duration of stay in the hospital<sup>5-11</sup>. In our study; Pain, erythema and edema associated with inflammation were reduced in patients who received heparin. Pain medication was reduced. Thus in this study, analgesic effects were evident with the usage of heparin and this agree with the prior studies.

Controversially, Teles et al., 2012<sup>4</sup> reported that that Heparin can be applied safely in the treatment of second degree burns of face and neck, however its beneficial effects need to be proven. Although he said that the heparin group used less non-opioids analgesics than the collagenase group. This may be because he didn't used it on 3<sup>rd</sup> degree burn and didn't used the traditional treatment in control group.

Wound healing time: The study found that heparin therapy was associated with faster healing of the second degree burns, as evidenced by the wound size, number of wounds healed and days needed to heal, we show that treatment of Second degree or partial thickness burns with topical heparin is superior to conventional treatment in terms of wound healing as well as for pain control<sup>11</sup>.

According to various studies,<sup>3,5,9-11</sup> prolonged inflammation and stagnation of neutrophils is characteristic 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. Presence of granulation tissue indicates progressive healing of burn wounds.

The revascularization makes zone of stasis converted to zone of hyperemia making wound to heal faster<sup>10</sup>

This study confirmed the previously mentioned findings, that heparin has multiple effects which include anti inflammatory effects, accelerating angiogenesis and restoring blood flow, and these factors directly promote wound healing process.

But Teles et al., 2012<sup>4</sup> reported that collagenase had a faster healing time as compared to topical heparin, this may be because he didn't used traditional antimicrobial drugs.

Antibiotic requirements: Prior studies,<sup>3,5,6</sup> have suggested that orally administered antibiotics can reach burns secondary to an increase in blood flow mediated by the enhanced neo-angiogenic revascularization of the ischemic tissue. A reduction in intestinal bacterial translocation and sepsis may be another partial explanation for the reduction of infection. None of the patients in Heparin group had weeping wounds, as compared to Control group. A reduction in infections was observed in non-weeping wounds in Heparin group as compared to Control group<sup>3</sup>.

This study augmented that patients in heparin group paid less for antibiotics, cause of reduced infection rate , faster healing and reduced hospital stay.

This study dispute Masoud et al., which reported that Blood and wound swab culture reports were not significantly different in the two groups. There was also no significant disparity vis-a-vis the organisms isolated and their drug sensitivity. Antibiotic administration continued till clinical parameters showed improvement.<sup>8</sup>

## CONCLUSION

This study showed that in patients with facial burns of thermal etiology, the use of topical heparin significantly reduces pain and edema, enhances faster healing and epithelialization, requires less antibiotics due to reduced infection rates than patients treated with topical antimicrobial creams.

There were secondary outcomes like patient satisfaction, alertness and cheerful, diminished need for grafting, improved

post burn sequelae, less burn treatment coast and reduced hospital stay.

Because of the ease of heparin dressing, the out patients can be dressed easily at home feeling safe among their family participants, and suffering no somatic pain or psychological disturbance, also the family will be more calm and thankful.

This could be beneficial for early rehabilitation of burned victims and early return to their work.

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