CASE REPORT

Journal of Plastic Surgery and Transplantation
Volume 6 Number 2, July–December 2025

Assessment of the Analgesic Efficacy of Alkalinized Heparin and Lignocaine in Pain Attenuation During Burn Dressing Changes

Divya Darshan[1], Ravi Kumar Chittoria[2], Amrutha J.S.[3], Sriram V.S.[4]

HOW TO CITE THIS ARTICLE:

Divya Darshan, Ravi Kumar Chittoria, Amrutha J.S. et al, Assessment of the Analgesic Efficacy of Alkalinized Heparin and Lignocaine in Pain Attenuation During Burn Dressing Changes. J of Pla Sur and Trans. 2025; 6(2): 63-68.

ABSTRACT

Heparin possesses anti-inflammatory, antihistaminic, anti-allergic, serotonin-blocking, and proteolytic enzyme-inhibiting properties. Topical forms of heparin have been used in burn care to prevent burn wound extension, minimize skin tissue loss, promote faster healing with fewer contractures, relieve pain, reduce tissue edema and exudation, prevent infection, and support revascularization, granulation, and epithelialization of deeply burned tissue. Similarly, topical lignocaine in gel form has been applied to raw burn areas and post-skin graft sites, showing significant effectiveness in pain relief. In addition to analgesia, lignocaine has also been shown to reduce edema and post-burn ischemia. In this case report, we discuss the combined use of topical heparin and local anesthetic as part of burn wound management.

KEYWORDS

• Topical Heparin • Lignocaine • Alkalinized • Burn • Wound • Management.

INTRODUCTION

Burns are a serious form of physical trauma that can profoundly impact both the physical and mental well-being of a patient. In managing burn injuries, it is essential to consider not only the physical suffering but also the prolonged hospital stays, loss of workdays, and significant financial burden. Patients

AUTHOR'S AFFILIATION:

[1] Junior Resident, Department of Plastic Surgery, JIPMER, Puducherry, India.

[2] Professor and Registrar (Academic), Head of IT Wing and Telemedicine, Department of Plastic Surgery and Telemedicine, JIPMER, Puducherry, India.

[3] Senior Resident, Department of Plastic Surgery, JIPMER, Puducherry, India.

[4] Senior Resident, Department of Plastic Surgery, JIPMER, Puducherry, India.

CORRESPONDING AUTHOR:

Ravi Kumar Chittoria, Professor and Registrar (Academic), Head of IT Wing and Telemedicine, Department of Plastic Surgery and Telemedicine, JIPMER, Puducherry, India.

E-mail: drchittoria@yahoo.com

➤ **Received:** 06-05-2025 ➤ **Accepted:** 21-07-2025

with burns require prompt and specialized care to reduce morbidity and mortality. Heparin is a multifunctional agent with anti-inflammatory, antihistaminic, anti-allergic, serotonin-blocking, and proteolytic enzyme-inhibiting properties.[1] It has been used via inhalational, parenteral, and topical routes in the treatment of thermal injuries. Topically, heparin has shown benefits in preventing burn wound extension, limiting skin tissue loss, accelerating healing with fewer contractures, relieving pain, reducing tissue edema and exudation, preventing infection, and promoting revascularization, granulation, and re-epithelialization of deeply burned tissue.[2]

Lignocaine, a local anesthetic, has demonstrated the ability to enhance analgesic effects, reduce the adverse consequences of opioid use, and decrease the need for escalating opioid doses in burn patients. Topical lignocaine gel has been effectively used on raw burn wounds and post-skin graft donor sites, with positive results indicating significant pain relief. By inhibiting the release of inflammatory mediators, lignocaine also helps reduce pain, edema, and post-burn ischemia.

Given the complementary benefits of both agents, this study was conducted to assess pain levels using the Visual Analogue Scale (VAS) over the first 24 hours following application. This review highlights the importance and potential effectiveness of a combined topical heparin and lignocaine therapy in the management of burn injuries.

MATERIALS AND METHODS

This prospective observational study was conducted in the Department of Plastic Surgery at a tertiary care institute in India, following approval from the departmental ethical committee. Informed written consent was obtained from the patient. The subject of the study was a 24-year-old male with no known comorbidities, who presented with second-degree deep thermal burns on the neck, chest, and upper limb, constituting 15% of the total body surface area (Figure 1). Upon admission, the patient was managed according to the WHO burns protocol. At the time of admission, the patient's Visual Analogue Scale (VAS) score for pain was 8/10.

Figure 1: burns at presentation

Figure 2: Heparin and lignocaine saline irrigation

A mixture of topical heparin and alkalinized lignocaine 2% was used for burn wound irrigation before each dressing. The burn wound was irrigated for 10-15 minutes with this mixture during every dressing change throughout the patient's hospital stay (Figure 2). Following the irrigation, a collagen dressing was applied to the burn wounds.

Mixture of Topical Heparin and Alkalinized Local Anesthetic Solution:

Combine 50,000 units of Heparin (10 mL of Heparin @ 5000 IU/mL), 200 mg Lidocaine hydrochloride (10 mL of 2% Lidocaine), and 420 mg Sodium Bicarbonate (5 mL of 8.4% Sodium Bicarbonate) in 15 mL of sterile water.[3,4]

Apply the solution by spraying (for large burn surface areas) or by dripping (for small burn surface areas).

A fresh solution should be prepared for each burn dressing.

Using a 20 mL syringe, the mixture was sprayed onto the burn area until the pain subsided. This procedure was repeated with every dressing change to provide pain relief and reduce the need for opioid medication. After the wound irrigation, the burn wounds were dressed with a collagen dressing.

RESULTS

Pain intensity was assessed using the Visual Analog Scale (VAS), where a score of 1 indicates no pain and 10 indicates the worst possible pain. After 15 minutes of irrigation with the topical solution, the dressing was applied, and the VAS pain score reduced to 3/10.

DISCUSSION

Burn injuries can be classified into six major categories based on the mechanism of injury: scalds, contact burns, fire, chemical, electrical, and radiation burns. Among liquid burns, spill and immersion scalds are further subtypes, while fire-related injuries are categorized into flash burns and flame burns. The mechanism of burn injury can serve as a predictor of clinical outcome. For instance, patients with flame or electrical burns often require hospitalization, whereas those with burns from sun exposure or hot surface contact are typically managed on an outpatient basis.

Burn injuries remain a major concern in critical care, especially among children, where they continue to be a significant global health issue contributing to severe morbidity and mortality. Despite general similarities in treatment protocols, there are notable physiological and psychological differences between pediatric and adult burn care. In neonates, infants, and children, the dermal layer is thinner than in adults, leading to increased risks of hypothermia due to evaporative losses and a greater need for isotonic fluid resuscitation.

Heparin, known primarily for its anticoagulant properties, possesses a flexible structure and strong anionic charge that allows it to interact electrostatically with a wide range of molecules.[5] Beyond anticoagulation, heparin has demonstrated anti-inflammatory and wound-healing properties.[6] It can accelerate the molecular processes of wound healing, making it particularly beneficial for both acute and chronic burn wounds. Initially, heparin enhances collagen production and deposition, but it later slows and facilitates collagen absorption, thereby preventing fibrin accumulation and scar formation.

Heparin also inhibits secretory neutrophil products such as elastase, cathepsin G, and proteinases that are known to degrade extracellular matrix components and growth factors, while promoting further neutrophil recruitment. Heparin limits the activity of these molecules through electrostatic interactions.[6] In burn care, heparin has been utilized for multiple roles beyond anticoagulation, including the treatment of sepsis, inhalation injuries, venous thrombosis, and in facilitating wound healing and pain management.[7]

Research has shown that heparin therapy improves blood flow, prevents clot formation and infarctions, reduces inflammation and pain, promotes revascularization of ischemic tissue, supports granulation tissue development, regulates collagen, minimizes scarring, and reduces the risk of contractures.[8] Clinically, patients experienced less pain, erythema, and edema following heparin application. A notable observation was that the required dose of heparin inversely correlated with the extent of burn injury.[9] Post-irrigation, blister exudates diminished, and the blisters acted as autologous biological dressings, revealing smooth new skin underneath, which often desquamated naturally within 10 to 14 days.

The improved outcomes in heparin-treated patients are primarily attributed to enhanced revascularization of ischemic tissues, likely due to heparin's pro-angiogenic properties.[10] These effects are especially beneficial during the early stages post-burn when inflammation and wound healing responses are most critical.[11] Topical heparin has been widely reported to promote faster and scar-less healing of burn wounds, and it provides significant pain relief as measured on the Visual Analogue Scale.[12]

However, certain complications have been reported with heparin use, including heparin-induced thrombocytopenia, osteoporosis, excessive bleeding from burn wounds, epistaxis, hemoptysis, hematuria, and allergic reactions.[13] To monitor for adverse effects, standard blood tests are supplemented with bleeding time, clotting time, and activated partial thromboplastin time (aPTT) measurements. The amount of topically applied heparin is typically guided by observed revascularization and granulation tissue formation.[14] Despite its efficacy, the high cost of heparin approximately ₹2500 for a 5 mL vial (5000 IU/mL) limits its widespread availability in resource-limited settings.

Lidocaine is a well-established local anesthetic recognized for its potent analgesic properties.[15] Although its use in burn care has historically been limited due to concerns about toxicity, allergic reactions, and delayed epithelialization, it is now understood that many of the previously reported allergic responses were due to epinephrine rather than lidocaine itself. True lidocaine allergies are exceedingly rare.[16-18]

CONCLUSION

A mixture of topical heparin and local anaesthetic (2% lignocaine) can be effectively used in the management of burn wounds, yielding satisfactory clinical outcomes.

Conflicts of interest: Nil

REFERENCES

1. Teot L, Otman S, Brancati A, Mittermayr R. Burn scar treatment. In: Kamolz LP, Jescheke MG, Horch RE, Küntscher M, Brychta P, editors. Handbook of Burns. Vienna: Springer; 2012. p. 5567.
2. Masoud M, Wani AH, Darzi MA. Topical heparin versus conventional treatment in acute burns: a comparative study. Indian J Burns 2014;22: 4350.
3. Catherine J. Sinnott, B.A.Joseph M. Garfield, M.D.Johannes G. Thalhammer, D.V.M.; Gary R. Strichartz, Ph.D. Addition of Sodium Bicarbonate to Lidocaine Decreases the Duration of Peripheral Nerve Block in the Rat. Anesthesiology October 2000, Vol. 93, 1045–1052.
4. C. Lowell Parsons; Paul Zupkas; Jeffrey Proctor; James Koziol; Amie Franklin; Dennis Giesing; Edward Davis; Charles M. Lakin; Bruce S. Kahn; William J. Garner (2012). Alkalinized Lidocaine and Heparin Provide Immediate Relief of Pain and Urgency in Patients with Interstitial Cystitis., 9(1), 207–212.
5. Alrich EM. The effect of heparin on the circulating blood plasma and proteins in experimental burns. Surgery 1949;25: 67680.
6. Lu J, Xu T, Yang M, Xu XW, Wu B. Heparin for the treatment of burns (Protocol). Cochrane Database Syst Rev 2011;12:CD009483.
7. Reyes A, Astiazaran JA, Chavez CC, Jaramillo F, Saliba MJ. Burns treated with and without heparin: controlled use in a thermal disaster. Ann Burns Fire Disasters 2001;14: 183-91.
8. Saliba MJ Jr, editor. The Effects of Heparin in the Treatment of Burns. Proceedings of International Meeting; 1994 Feb 24-27.
9. Vijayakumar C, Prabhu R, Senthil Velan M, *et al.* (August 17, 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.
10. Saliba MJ Jr, Dempsey WC, Kruggel JL. Large burns in humans. Treatment with heparin. JAMA 1973;225: 261-9.
11. Ferreira Chacon JM, Mello de Andrea ML, Blanes L, Ferreira LM. Effects of topical application of 10,000 IU heparin on patients with perineal dermatitis and seconddegree burns treated in a public pediatric hospital. J Tissue Viability 2010;19: 150-8.
12. Elsayed E, Becker RC. The impact of heparin compounds on cellular inflammatory responses: a construct for future investigation and pharmaceutical development. J Thromb Thrombolysis 2003;15: 11-8.

13. Saliba M.J. Heparin in the treatment of burns: A review. Burns. 2001;27: 348-357.
14. Rayes A., Astiazaran J.A., Chavez C.C., Jaramilla F., Saliba M, J. Burns treated with and without heparin: Controlled use in a thermal disaster. Annals of Burns and Fire Diasters. 2001;14: 183-191.
15. Vigneault L, turgeon AF, Côté D, Lauzier F, Zarychanski R, Moore L, *et al.* Perioperative intravenous lidocaine infusion for postoperative pain control: a meta-analysis of randomized controlled trials. Can J Anesth Can Anesth. 2011 Jan 1;58(1):22-37.
16. Wasiak J, Spinks A, Costello V, Ferraro F, Paul E, Konstantatos A, *et al.* Adjuvant use of intravenous lidocaine for procedural burn pain reliet: A randomized double-blind, placebo-controlled, cross-over trial. Burns. 2011 Sep;37(6):951-7.
17. Wasiak J, Mahar PD, McGuinness SK, Spinks A, Danilla S, Cleland H, *et al.* Intravenous lidocaine for the treatment of background or procedural burn pain. Cochrane Database of Systematic Reviews.Chisester, UK: John Wiley & Sons, Ltd; 2014
18. B T Brofeldt 1, P Cornwell, D Doherty, K Batra, R A Gunther, Topical lidocaine in the treatment of partial-thickness burns, J Burn Care Rehabil.,1989 Jan-Feb;10(1):63-8.