

# Role of Topical Insulin Management in Burns Patient Management

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## Abstract:

Thermal burn injuries impose significant physical and psychological distress, particularly in underdeveloped regions. Facilitating early wound healing is paramount to mitigate ensuing complications. Insulin, easily accessible, has emerged as a potential agent for expediting wound recovery. This study endeavors to assess the therapeutic efficacy of topical insulin in second and third-degree burn injuries. The research involved a 42-year-old male who was admitted with alleged history of suicidal burns involving his trunk, bilateral thigh, and bilateral axilla. The patient was initially managed with iv fluids and dressing done with insulin solution applied topically daily. Data collection encompassed demographic details, tissue culture findings, wound discharge, pain intensity, granulation tissue formation, and wound contraction

**Keywords:** topical insulin therapy; burns; regenerative therapy; wound management

## Introduction

Burn injuries present notable physiological and psychological hurdles, necessitating specialized interventions including fluid regulation, electrolyte monitoring, wound management, respiratory and nutritional support, infection control, and in severe cases, addressing sepsis and multiple organ failure. Accelerating wound recovery is paramount to mitigate burn-related complications like hypertrophic scarring and joint contractures. Evaluation of burn severity, typically done via the rule of nines or Lund and Browder chart, guides fluid and nutritional therapy. Assessing burn depth is crucial for determining appropriate conservative or surgical measures, distinguishing between epidermal, superficial partial-thickness, deep partial-thickness, and full-thickness burns. Effective burn care mandates a thorough evaluation, assessment, and treatment approach. While superficial and partial-thickness burns may resolve spontaneously, deeper burns often require prompt surgical intervention to prevent complications and prepare the wound bed for tissue coverage. Infection stands as a primary culprit for morbidity and mortality in extensive burns, leading to delayed healing and systemic infections. Diverse topical therapies, ranging from antibiotic creams to silver/iodine-releasing dressings, are utilized in burn wound management. Moreover, certain medications like insulin and phenytoin, originally designed for unrelated conditions, exhibit wound-healing

properties and are increasingly utilized in burn care. Insulin, initially indicated for diabetes management, is linked with wound healing by stimulation of growth factors.

## Materials and Methods

This study was conducted in the Department of Plastic Surgery at a tertiary care center after getting the departmental ethical committee approval. Informed written consent was taken from the patient's attender. The details of the patient in the study are as follows: A 42-year-old male was admitted with alleged history of suicidal burns involving his trunk, bilateral thigh, and bilateral axilla (figure 1). Patient was initially managed with iv fluids and topical insulin therapy was initiated within 48 hours post-admission (figure 2), was dispersed over the wound surface and covered with Vaseline gauze dressings. Patients underwent monitoring for wound discharge, pain intensity, granulation tissue formation, and wound contraction every three days. Additional systemic support, such as nutritional supplementation, antibiotics, and analgesics, was administered as deemed necessary for individual patient care



**Figure 1:** Intraoperative picture at time of admission



**Figure 2.** Topical insulin application

## Result

This investigation involved a 42-year-old male with thermal burns encompassing approximately 38% of his body surface area, primarily due to accidental injuries affecting the thorax, back bilateral thigh, bilateral arm region. Topical insulin solution was administered over 5-7 sessions.

Substantial progress in wound healing was evident, characterized by heightened granulation tissue formation and re-epithelialization, assessed through digital planimetry software to quantify wound contraction (Figure 3).



**Figure 3:-** healing of burn wound,with reduction of tbsa

Gradual reduction in wound discharge from moderate to mild was observed, alongside a notable decrease in subjective pain perception from severe to mild/no pain. No systemic or local adverse effects were documented in this patient.

### Discussion

Burn injury is a major cause of trauma to the human body, causing death as well as disability, with a long healing period. The mortality rate of burn injury has decreased with new treatment modalities, but secondary infections and prolonged healing periods still affect the mortality rates. For this purpose, different kinds of dressings and pharmacotherapies have been developed, but most are costly, and the mechanisms underlying these therapies have not been fully documented. Many therapeutic methods are available to affect the wound healing such as the topical application of insulin, growth factors, negative pressure assisted wound closure, oxidized regenerated cellulose/collagen, hyaluronic acid conjugated with glycidyl methacrylate or gelatin dressings.

Role of topical insulin in wound healing has been in literature since 1970s [1]. Studies done in animal models and humans have found that topical Insulin therapy exerts its effects through the IGF 1 receptor. Insulin is known to stimulate keratinocytes and also the rate of endothelial proliferation leading to a faster neovascularization and also formation of granulation tissue [2]. Topical insulin application rapidly induces upregulation of the insulin signalling related proteins on wound

areas following injury. IRS-1 binds the PI3-kinase, one of the SH2 proteins, through the multiple tyrosine phosphorylated sites [3, 4].

Insulin triggers the keratinocyte migration depending on the dose and time in the chronic wounds. Insulin demonstrates its effect through an insulin receptor dependent but EGF/EGF-R non-dependent way. The fact that it increases the keratinocyte migration on the PI3K-Akt-Rac1 pathway and cause stimulation of the keratinocytes by enabling the production of  $\alpha 3$  and LN332 molecules has been proven by the in vitro studies [6,7,8,9]. Insulin is a hormone that also affects collagen production. Insulin selectively and strongly stimulates the collagen production in dermal fibroblasts [10, 11]. The cost of insulin ranges from 130-500 INR per vial. There were no systemic side effects for the insulin being given topically.

### Conclusion

Our study delved into the adjunctive use of topically administered insulin revealing a notable progression in wound healing, granulation, diminished discharge, and alleviated pain, collectively expediting the process of wound healing. It is paramount to conduct additional controlled trials to validate these observations and ascertain the efficacy of phenytoin as an adjunctive intervention in wound management.

**Competing interest:** None

**Declarations:** Author's contributions

All authors made contributions to the article **Availability of data and materials:** Not applicable **financial support and sponsorship:** None

**Consent for publication:** Not applicable

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