

# Nanocrystalline Silver–Collagen Topical Therapy in the Treatment of Scald Burns: A Case Report

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## ABSTRACT

Biological dressings have been widely used in the management of burn wounds, with collagen- and human amnion-based dressings being among the most commonly employed options. Commercially available collagen dressings are usually supplied as dry sheets; however, these sheets may adhere to the wound surface and surrounding skin, causing discomfort to patients, particularly during dressing changes and clothing removal. In this article, we present our experience with the use of topical collagen gel containing nanocrystalline silver and purified bovine Type I collagen in the management of a burn wound. Our observations suggest that collagen gel with nanocrystalline silver dressing may serve as an effective biological dressing alternative in burn wound care, with advantages including ease of application, patient comfort, and satisfactory wound healing outcomes compared to conventional collagen sheets.

**Keywords:** Collagen, Nanocrystalline Silver, Scald, Burns.

## INTRODUCTION

According to estimates by the World Health Organization (WHO), thermal burn injuries account for more than 300,000 deaths annually worldwide [1]. In addition to mortality, burns cause significant physical morbidity and long-term psychological distress. Effective burn management requires prompt resuscitation and meticulous wound care, with wound dressings playing a pivotal role. An ideal burn dressing maintains an optimal moist environment, minimizes fluid and heat loss, reduces pain, and provides a barrier against microbial invasion. Over time, wound dressings have evolved considerably. Early biological dressings, such as human amnion, were widely used to promote wound healing. However, concerns regarding availability, storage, and the risk of viral transmission limited their widespread acceptance.

Collagen membranes later emerged as a popular alternative owing to their ease of storage, availability in various sizes and forms, and reduced risk of infection transmission. Once applied, collagen adheres to the

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raw wound surface and separates spontaneously as re-epithelialization occurs. Despite these advantages, collagen membranes may pose certain limitations: their removal can be painful, and when applied over flexor or irregular surfaces such as the face, ears, or nose, they may restrict movement and crack upon drying. Collagen is currently available in multiple formulations, including dry sheets, wet membranes, granules, gels, and creams. Combining collagen with antimicrobial agents, particularly silver, significantly reduces the risk of secondary infection. Nanocrystalline silver possesses broad-spectrum antimicrobial activity with reduced cytotoxicity compared to conventional silver preparations. This study aims to evaluate the role of a

collagen-based cream combined with nanocrystalline silver in the management of second-degree scald burns.

#### MATERIALS AND METHODS

This study was conducted in the Department of Plastic Surgery at a tertiary care centre after obtaining approval from the departmental ethics committee. The subject was a 34-year-old female with no known comorbidities who sustained second-degree scald burns due to accidental spillage of boiling water. The total burn surface area involved was approximately 15% TBSA, affecting both shoulders, the left arm, right forearm, and right flank (Figure 1).



**Figure 1.** Wound on presentation in the left lower abdomen.

The patient was admitted to the burns ward and managed with adequate analgesia, intravenous fluids, and antibiotics as per institutional protocol. The burn wounds were thoroughly cleansed with normal saline, following which a nanocrystalline silver with collagen-based cream was

applied over the affected areas (Figure 2). A secondary foam dressing was used for coverage. The wound was reviewed periodically and dressings done at post burn day 9 wound showed epithelisation (Figure 3).



**Figure 2.** Application of Nanocrystalline Silver-Collagen cream.



**Figure 3.** Epithelisation noted on day 9 post burn.

## RESULTS

Wound was reviewed at 3-day intervals and wound showed improvement in the Bates-Jenson wound assessment tool. Signs of epithelisation was noted on post burn day 9.

## DISCUSSION

Superficial and partial-thickness burns are commonly managed conservatively using topical agents and dressings. Conventional burn dressings include biological materials such as human amnion and topical agents like silver sulfadiazine. Other options include allografts and heterografts, which are primarily used as temporary wound covers in the acute phase.

Allografts, whether cadaveric or from living donors, are associated with limitations such as donor scarcity, ethical concerns, immunologic reactions, and potential viral transmission. Heterografts, particularly collagen-based dressings, have therefore gained widespread acceptance. In India, the Central Leather Research Institute (CLRI), Chennai, has developed patented methods to extract and reconstitute collagen from animal skin into usable sheets.

Collagen dressings provide mechanical support and act as an essential substrate for cellular adhesion, migration, and proliferation [2,3]. Collagen plays a crucial role in tissue regeneration, exhibits low antigenicity, and supports wound healing across both early and late phases [4-7].

Despite these advantages, collagen membranes may crack upon drying and restrict movement when applied over flexor or irregular surfaces such as the face. These limitations have led to increased interest in topical collagen formulations.

Collagen gel or cream offers superior conformity, ease of application, and improved patient comfort, particularly over joints and facial regions. However, topical formulations lack the mechanical barrier provided by collagen sheets.

The addition of nanocrystalline silver enhances antimicrobial protection while minimizing cytotoxic effects. Reported healing times for superficial burns treated with topical collagen range from 3 to 21 days. In the present study, complete healing occurred by 9 days, which is comparable with existing literature.

## CONCLUSION

Topical application of collagen-based cream combined with nanocrystalline silver is a safe, effective, and patient-friendly option for the management of second-degree scald burns. It offers understandable advantages over collagen membranes, particularly for application on flexor surfaces and the face, without causing pain or movement restriction.

The therapeutic benefits of collagen heterografting can thus be achieved through a topical collagen-nanocrystalline silver formulation. Larger studies are required to further validate these findings and establish standardized treatment protocols.

## CONFLICT OF INTEREST

None declared.

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