DOI: 10.21088/ijmhs.2347.9981.13226.7

Indian Journal of Medical & Health Sciences
Volume 13 Number 2 July - December 2026

CASE REPORT

Evaluation of Wound Healing Following Biosilk containing Silver Oxide Application in an Extensive Burn Injury: A Case Report

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HOW TO CITE THIS ARTICLE:

Amelia Lalthatluangi, Dharmendra Kumar Raju Komannapalli, Shanmuga Priya R et. al, Evaluation of Wound Healing Following Biosilk containing Silver Oxide Application in an Extensive Burn Injury: A Case Report. Jr. Med. & Health Sci. 2026; 13(2): 116–120.

ABSTRACT

Burn wounds involve extensive tissue injury and may result in delayed healing, infection, prolonged inflammation, and scarring. Biosilk, a silk-based dressing containing silver oxide and Centella asiatica, may support wound healing through regenerative and antimicrobial properties. We report the case of a 52-year-old female with a 25% total body surface area burn involving the face, bilateral arms and forearms, bilateral legs, and dorsum of both feet. The wound was assessed using the Bates-Jensen Wound Assessment Tool (BWAT), with a baseline score of 35. Following 10 days of Biosilk Ag application, the BWAT score decreased to 13, representing a 22-point reduction, accompanied by healthier granulation tissue and overall improvement in wound appearance. This case suggests that Biosilk Ag may have potential as an adjunctive biomodified dressing in extensive burn wound management. However, larger controlled studies are required to establish its efficacy and independent contribution to wound healing.

KEYWORDS

• Burn Wounds • Biosilk Ag • Silver Oxide • Centella Asiatica • Silk-Based Dressing • Wound Healing • Burns Management • Bates-Jensen Wound Assessment Tool • Granulation Tissue

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➢ **Received:** 22-08-2026 ➢ **Accepted:** 01-10-2026

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INTRODUCTION

Wound healing is a complex and coordinated biological process involving several overlapping phases, including haemostasis, inflammation, proliferation, and remodelling. Different cell types, including neutrophils, macrophages, lymphocytes, keratinocytes, fibroblasts, and endothelial cells, contribute to these processes and play an important role in restoring tissue integrity.[1]

Burn wounds present a particular challenge because extensive tissue injury can interfere with the normal healing process and increase the risk of infection, delayed epithelialization, excessive exudation, and scarring. The extent and depth of the burn, along with the patient's overall clinical condition, can influence the rate and quality of wound healing. Maintaining an appropriate wound environment and facilitating granulation tissue formation and re-epithelialization are therefore important aspects of burn wound management.

When wound healing is delayed, the wound may remain in a prolonged inflammatory phase, leading to impaired cellular proliferation, angiogenesis, extracellular matrix formation, and tissue remodelling.[2] Such wounds may also be associated with persistent pain and functional limitations, which can adversely affect quality of life.[3]

In recent years, biologically active and biomodified wound dressings have gained increasing interest because of their potential to create a favourable environment for tissue repair. Silk-based biomaterials are particularly promising because of their biocompatibility, mechanical strength, and versatility in biomedical applications. The incorporation of bioactive substances into silk-based materials may further enhance their potential role in wound management.[4]

Biosil is a biomodified silk-based wound dressing containing components that may contribute to wound repair through complementary mechanisms. Silk can provide a supportive matrix for tissue regeneration, while bioactive components may assist in maintaining a favourable wound environment. Previous studies have explored the use of silk-based materials, biofunctionalized silk dressings, and Centella asiatica-based preparations in wound healing.[5-12] Silver-containing wound-care materials may also provide antimicrobial activity, which may be particularly relevant in extensive burn wounds because disruption of the normal skin barrier increases susceptibility to microbial colonization.[13]

The present case report describes the clinical course of a 52-year-old female with a 25% total body surface area (TBSA) burn involving the face, bilateral forearms and arms, bilateral legs, and dorsal aspects of both feet. The progression of wound healing was objectively assessed using the Bates-Jensen Wound Assessment Tool (BWAT) before and after treatment with Biosilk containing silver oxide and Centella asiatica.

MATERIALS AND METHODS

A 52-year-old female presented with extensive burn injuries involving approximately 25% TBSA. The affected areas included the face, bilateral forearms and arms, bilateral legs, and dorsum of both feet.



Figure 1: Wound before application of Biosilk Ag at presentation

The wounds were clinically assessed, and the baseline wound status was documented using the Bates-Jensen Wound Assessment Tool (BWAT). The initial BWAT score before initiation of Biosilk Ag dressing was 35 (Figure 1).



Figure 2: Use of Biosilk Ag powder for wound healing

Biosilk Ag dressing was subsequently used as part of the wound-management protocol(Figure 2). The wound was monitored clinically during the treatment period, with assessment of wound-bed characteristics and overall progression of healing. After 10 days of Biosilk application, the wound was reassessed using the BWAT(Figure 3).



Figure 3: Wound 10 days after application of Biosilk Ag

RESULTS

A progressive improvement in wound characteristics was observed following the use of Biosilk dressing.

The initial BWAT score was 35, recorded before the application of Biosilk Ag. After 10 days of treatment, the BWAT score decreased to 13, indicating a marked improvement in the assessed wound characteristics.

The reduction in the BWAT score was accompanied by clinical improvement in the wound bed, with progression towards healthier granulation tissue and overall improvement in the appearance of the affected wounds.

Thus, within a 10-day period, the BWAT score demonstrated a substantial reduction from 35 to 13, corresponding to an improvement of 22 points from the baseline assessment.

DISCUSSION

Effective wound healing requires the coordinated progression of haemostasis, inflammation, cellular migration and proliferation, angiogenesis, re-epithelialization, extracellular matrix deposition, and subsequent remodelling.[4] Growth factors including transforming growth factor (TGF), platelet-derived growth factor (PDGF), fibroblast growth factor (FGF), and epidermal growth factor (EGF) have important roles in regulating these processes.

Extensive burns can disrupt several stages of normal wound healing because of the degree of tissue injury and loss of the protective skin barrier. Consequently, wound-management strategies that support tissue regeneration, promote granulation and epithelialization, and maintain an appropriate wound environment may be beneficial.

In the present case, Biosilk was used in a 52-year-old female with a 25% TBSA burn involving multiple anatomical regions. A substantial improvement in the objective wound assessment was observed over 10 days, with the BWAT score decreasing from 35 at baseline to 13 after treatment. The improvement was also associated with favourable changes in the appearance of the wound bed.

Silk-based biomaterials have attracted considerable attention in tissue engineering and wound management because of their favourable mechanical properties, biocompatibility, and potential for structural

modification.[5-9] Silk fibroin can provide a supportive framework for cellular attachment and tissue regeneration and has consequently been investigated for applications in skin and other forms of tissue repair.

Schneider *et al.* investigated biofunctionalized silk mats incorporating epidermal growth factor (EGF) as a topical dressing for wound healing. The study demonstrated enhanced wound closure, with an approximately 90% increase in wound closure associated with advancement of the epidermal tongue.[10] These findings support the potential of biofunctionalized silk materials as platforms that may facilitate biological processes involved in wound repair.

Centella asiatica has also been investigated for its potential role in wound healing. Experimental studies have demonstrated wound-healing activity of different Centella asiatica extracts in both incision and burn wound models. Proposed mechanisms include modulation of inflammation, stimulation of collagen synthesis, promotion of angiogenesis, reduction of oxidative stress, and enhancement of cellular proliferation. These effects may be associated with pathways involving growth factors such as fibroblast growth factor and vascular endothelial growth factor.[11]

Previous clinical work has reported improvement in chronic ulcers following the use of 1% Centella asiatica preparations.[12] Although the present case concerns an extensive burn wound, rather than a chronic ulcer, these findings provide a basis for further investigation of Centella asiatica-containing wound-care preparations.

Silver-containing wound-care materials may provide an additional benefit because of their antimicrobial properties. Silver ions can interact with negatively charged microbial and cellular components, including proteins and nucleic acids, thereby exerting antimicrobial and bactericidal effects.[13] This property may be relevant in extensive burn wounds, where disruption of the skin barrier can increase the risk of microbial colonization.

The marked reduction in the BWAT score from 35 to 13 over 10 days represents a substantial improvement in the wound assessment during the period of Biosilk use. The accompanying clinical improvement in the wound bed further supports the observed progression towards healing.

Nevertheless, this is a single case report, and the observed improvement cannot be attributed exclusively to Biosilk. Burn wound healing is influenced by several factors, including the extent and depth of the burn, systemic condition of the patient, infection control, nutrition, and other aspects of wound care. Therefore, larger prospective studies and controlled clinical trials are required to determine the efficacy and independent contribution of Biosilk in burn wound healing.

CONCLUSION

This case describes the use of Biosilk dressing in a 52-year-old female with a 25% TBSA burn involving the face, bilateral arms and forearms, bilateral legs, and dorsum of both feet.

Following 10 days of Biosilk treatment, the Bates-Jensen Wound Assessment Tool score decreased from 35 at baseline to 13, accompanied by clinical improvement in the wound bed and progression towards healthier granulation tissue.

The findings suggest that Biosilk may have potential as an adjunctive biomodified dressing in the management of extensive burn wounds. However, controlled studies involving larger patient populations are necessary to establish its efficacy, safety, and specific contribution to wound healing.

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