

Biosilk Application Therapy in Management of Chronic Non-Healing Ulcer

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Abstract

Haemostasis, inflammation, proliferation, and remodelling are the steps that comprise the complex biological process of wound healing. Chronic wounds often remain static in the inflammatory stage of wound healing beyond the expected duration and resist healing. Biosilk or biomodified silk dressing is believed to aid in accelerating the wound healing process. The combination bio functionalised silk matrix with silver oxide and Centella asiatica, a medicinal plant with wound healing properties, has been found to be effective in managing chronic non-healing wounds.

Keywords: Biosilk, Biomodified Silk, Wound Healing, Wound Management.

INTRODUCTION

Wound healing is a complex biological process which comprises of haemostasis, inflammation, proliferation, and remodelling. Cells that are involved in this process include neutrophils, macrophages, lymphocytes, keratinocytes, fibroblasts, and endothelial cells.¹ A chronic wound is one that does not heal in the expected sequence and in a predictable length of time, or one that does

not heal within three months.² Chronic wounds often remain static in the inflammatory stage of wound healing beyond the expected duration.³ The predominant issue that patients with chronic ulcers face is persistent pain. In the recent years, biological dressings have gained popularity and have been found to benefit patients with chronic wounds. One such dressing substance being explored is biosilk containing silver oxide and Centella asiatica, a medicinal plant. Its use is thought to enhance the wound healing process.

MATERIALS AND METHODS

A 40 years old gentleman, with nocomorbidities, presented with complaints of non-healing ulcer over back for the past 9 years. He had history of electrical burns 10 years back following which he had burns injury over lower back and bilateral posterior aspect of thighs. He had no history of raw areas elsewhere.

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On examination at presentation, he had an ulcer located over right side of lower back, of size 8x6cm, bleeding on touch, with everted edges. (Figure 1) There were scars present around the region of raw area.

Histopathological examination was done which revealed squamous cell carcinoma for which he underwent wide local excision. Post wide local excision various innovative methods were employed to hasten the wound healing process.

On post operative day 30, biosilk in cream form was applied (Figure 2) whose constituents include silk, Centella asiatica, silver oxide. Following application of biosilk, dry collagen sheets were applied (Figure 3) and the wound was then covered using negative pressure wound therapy technique (Figure 4). This dressing was done similarly for 3 sittings over a span of 2 weeks following which wound dimensions were measured and was found to be as shown in figure 5.



Fig. 1: Raw area at presentation



Fig. 3: Collagen sheet application over raw area

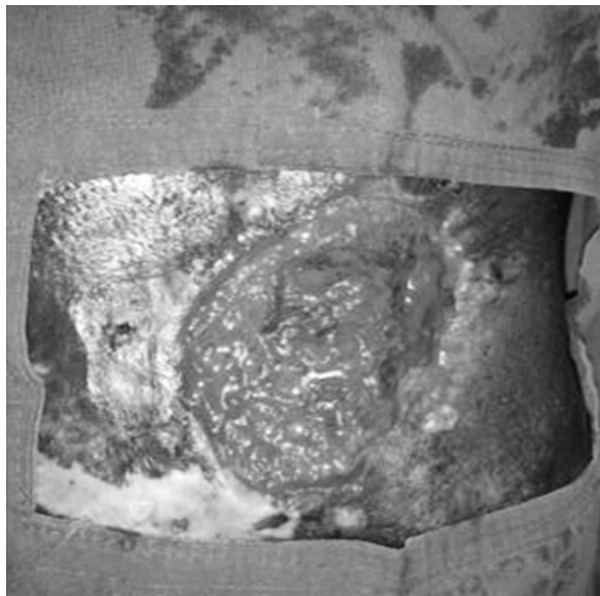


Fig. 2: Biosilk application over raw area

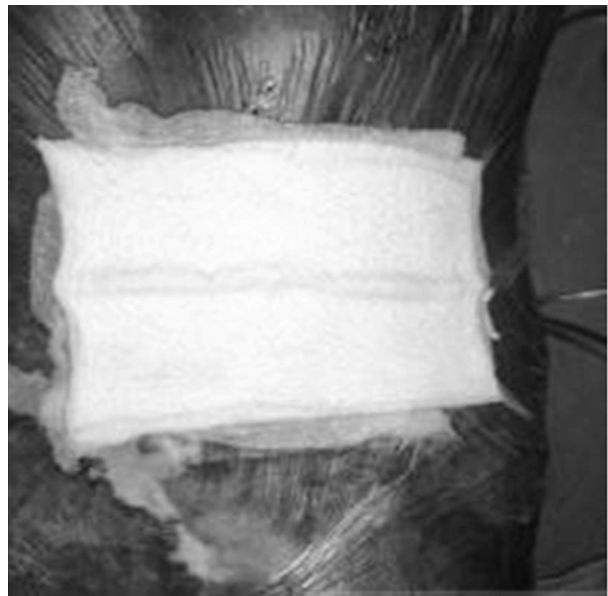


Fig. 4: Negative pressure wound therapy



Fig. 5: Raw area at the end of 3 sittings of biosilk application

RESULT

At the end of 3 sittings of biosilk ointment dressing, there was accelerated wound healing noted of the raw area of back with healthy granulation tissue.

DISCUSSION

Wound healing to be adequate requires rapid hemostasis, appropriate inflammation, mesenchymal cell differentiation, proliferation, and migration to the wound site, angiogenesis, and prompt re-epithelialization and proper synthesis, cross-linking, and alignment of collagen to provide strength to the healing tissue.⁴ Growth factors such as transforming growth factor (TGF)- β , platelet-derived growth factor (PDGF), fibroblast growth factor (FGF), and epidermal growth factor (EGF) play a crucial role in facilitating the above mentioned steps of wound healing.

The aim of this study was to explore the effects of use of biosilk in wound healing. The combination used here included silk, *Centella asiatica* extract, and silver oxide, each of which carry important properties that affect wound healing. Due to the unique properties of silk, such as, great mechanical strength, outstanding biocompatibility, and the capacity to modify the structural and morphological aspects of silk proteins, they represent a new class of sophisticated biomaterials. It has proven to be a beneficial material in biomedical engineering applications such as skin, bone, and vascular grafts.⁵⁻⁹ Schneider

et al conducted a study regarding use of silk mats incorporated with epidermal growth factor (EGF), for the promotion of wound healing processes and was concluded that there was an increase in wound closure by the epidermal tongue by 90%.¹⁰

Centella asiatica facilitate the wound healing process in both incision and burn wounds. Amongst a variety of extracts obtained for this plant, asiatic acid in the ethyl acetate extract seemed to be the most active component for healing the wound.¹¹ It has been reported that 1% *C. asiatica* extract cream improves wound healing of chronic ulcer.¹² It works by inhibiting inflammation, inducing collagen synthesis, promoting angiogenesis, inducing vasodilation, reducing wound oxidative stress in addition to promoting cellular growth and proliferation in injured tissues which may be related to growth factors such as endothelial growth factor, fibroblast growth factor and vascular endothelial growth factor.¹¹

The third component of the ointment was silver oxide which has great antimicrobial and bactericidal properties which is due to reaction of the highly charged silver ion (Ag⁺) to the negatively charged particles such as proteins, DNA, RNA, and chloride ions.¹³

CONCLUSION

In this study, we have understood to role of biosilk or biomodified silk in enhancement of wound healing and the properties of various properties of biosilk that facilitate the same. To confirm the effectivity of biosilk in healing of wound, it is required to conduct larger randomised control trials.

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