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Comparative evaluation of collagen and silicone foam dressings embedded with autologous PRP in equine wound healing

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Abstract

Distal limb wounds are common in horses following traumatic injuries and often require prolonged management. This study evaluated the comparative wound healing efficacy of collagen and silicone extracellular matrix (ECM) dressings embedded with autologous platelet-rich plasma (PRP) in equine cutaneous wounds. Twelve horses were randomly assigned to two groups (n = 6 each), with Group I receiving collagen-PRP dressing and Group II receiving silicone-PRP dressing. Dressings were applied on days 0, 5, 15, 30, and 45, with changes every 3-4 days based on wound size and exudate. Both treatments were well tolerated with no adverse tissue reactions observed. The mean percentage of wound healing was significantly higher in the collagen-PRP group at all-time points, with statistically significant differences on days 15 ($p \leq 0.05$) and highly significant differences on days 30 and 45 ($p \leq 0.01$). Collagen-PRP dressing promoted faster healing compared to silicone-PRP dressing. Based on these findings, collagen-PRP represents a biocompatible and effective regenerative therapy that may reduce healing time, minimize infection risk, and improve clinical outcomes in equine wound management.

Keywords: Wound, PRP, collagen, silicone

Introduction

In horses, wounds of the distal limbs commonly occur following traumatic incidents. Standard treatment protocols generally involve thorough wound debridement followed by the application of appropriate bandaging, often continued for several weeks or even months. In certain situations, the duration of healing becomes a major concern for horse owners, prompting veterinarians to adopt advanced wound management strategies to accelerate the healing process (Alford *et al.*, 2012; Provost, 2012; Xian *et al.*, 2015; Yamauchi *et al.*, 2016) [1, 5, 10, 11]. Regenerative therapeutic approaches, including the use of extracellular matrix (ECM) components and autologous platelet-rich plasma (PRP), help establish a favorable microenvironment that supports rapid and effective wound repair. Collagen, a natural ECM component, facilitates cell adhesion, proliferation, and differentiation, thereby enhancing tissue regeneration. Commercially available collagen dressings in various forms such as sheets, powders, gels, and sponges have been shown to promote epithelialization during wound healing (Ruszczak, 2003) [7]. In contrast, silicone dressings are synthetic, non-adherent, and fully occlusive materials that aid wound healing while limiting the development of exuberant granulation tissue, a common complication in equine wounds (Ducharme-Desjarlais *et al.*, 2005) [4]. The present study was designed to comparatively evaluate the wound healing efficacy of autologous PRP when combined with collagen and silicone dressings in the treatment of cutaneous wounds in horses.

Materials and Methods

The study was conducted on horses presented with cutaneous wounds to the Large Animal Surgical Outpatient Unit, Madras Veterinary College Teaching Hospital, Chennai, from 2017

to 2021. Twelve clinical cases were randomly divided into two groups (n = 6 each), wherein Group I received collagen extracellular matrix (ECM) dressing embedded with autologous platelet-rich plasma (PRP) and Group II received silicone ECM dressing embedded with autologous PRP. Autologous equine PRP was prepared using a double centrifugation method as described by Arguelles *et al.* (2005) [2]. In Group I, a wet collagen sheet (VILLICOL Type -I Collagen, manufacture by colognes is health care Pvt. Ltd.) layered with activated PRP gel was applied directly to the prepared wound surface and covered with a three-layer bandage consisting of a primary collagen-PRP dressing, a secondary cotton padding layer, and a tertiary protective layer. In Group II, activated PRP gel was spread over a silicone foam dressing (ALLEVYN Gentle Border®, Smith & Nephew) and applied to the wound using the same bandaging protocol. Dressings for both groups were performed on days

0, 5, 15, 30 and 45, with bandage changes every 3-4 days based on the extent of wound exudation and contamination.

Results and Discussion

In Groups I and II, six horses each with cutaneous wounds were treated using collagen and silicone extracellular matrix (ECM) dressings embedded with autologous platelet-rich plasma (PRP), respectively (Fig. 1 & 2). Both treatment modalities were well tolerated, and the silicone foam dressing showed good biocompatibility with no observable adverse tissue reactions at days 0, 5, 15, and 45 following application. Dressing replacements were carried out at 3-4 day intervals based on wound size and the volume of exudate.

The mean ($\pm$ SE) percentage of wound healing observed in both groups at different post-treatment intervals is presented in Table 1, highlighting the comparative healing response between collagen-PRP and silicone-PRP dressings.

Table 1: Percentage of wound healing (Mean $\pm$ S.E) of cutaneous wounds in group I and group II animals

Treatment	5 Day Wound Healing	15 Day Wound Healing	30 Day Wound Healing	45 Day Wound Healing
Group I	27.58 $\pm$ 7.38	46.41 $\pm$ 9.76	70.21 $\pm$ 8.17	82.78 $\pm$ 5.63
Group II	25.36 $\pm$ 1.05	27.91 $\pm$ 5.16	36.53 $\pm$ 6.93	45.76 $\pm$ 7.55
't' value	0.85 NS	2.156*	2.923**	3.545**

NS - Non Significant ($P \geq 0.05$)

* - Significant at 5% Level of significant ($p \leq 0.05$)

The mean ($\pm$ SE) percentage of total wound healing in Group I animals showed a consistent and progressive increase over the observation period, whereas Group II animals demonstrated comparatively lower healing percentages at corresponding time points. This resulted in a significantly higher overall wound healing response in equines treated with collagen dressing embedded with autologous platelet-rich plasma compared to those treated with silicone foam dressing combined with PRP. Statistical analysis revealed a significant difference between the two groups on day 15 ($p \leq 0.05$) and a highly significant difference on days 30 and 45 ($p \leq 0.01$).

In the present investigation, the collagen dressing was well tolerated, with no evidence of local tissue reaction, indicating good biocompatibility. These findings are consistent with previous reports by Swaim *et al.* (2000) [9], You *et al.* (2017)

[12], Ramanathan *et al.* (2018) [6], and Santhanam *et al.* (2020) [8], who demonstrated the safety and effectiveness of collagen-based wound dressings. The positive response observed in this study may be attributed to the inherent properties of collagen, including low immunogenicity, reduced risk of infection, and high compatibility with host tissues, which collectively support cellular attachment and tissue regeneration. Similarly, in Group II, silicone foam dressing was found to be biocompatible and easy to apply for the management of equine cutaneous wounds. No adverse tissue reactions were observed during the treatment period, confirming its suitability for wound care. These results align with the findings of Desjarlais *et al.* (2005) [4], who reported that silicone foam dressings promote wound healing while minimizing local tissue irritation in horses.



Fig 1: Collagen ECM embedded with autologous platelet rich plasma- Group I



Fig 2: Silicone ECM embedded with autologous platelet rich plasma-Group II

Conclusion

Based on this study, collagen dressing embedded with autologous platelet-rich plasma (PRP) significantly enhanced wound healing in horses compared to silicone foam-PRP dressing. Its application may reduce healing time, lower the risk of infection, and improve clinical outcomes in veterinary practice.

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