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Research Article

Enhancing Burn Wound Healing with Autologous Platelet-Rich Plasma (APRP): A Promising Adjunctive Therapy

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Abstract

Aims

This study aimed to evaluate the effectiveness of autologous platelet-rich plasma (APRP) as an adjunctive therapy in enhancing the healing process of burn wounds. APRP is a concentrated source of platelets rich in growth factors that promote tissue repair, angiogenesis, and epithelialization.

Methodology

A 45-year-old male patient with second-degree burns on the face, upper limbs, and lower limbs was treated with APRP. The plasma was prepared using a standardized centrifugation method and infiltrated at the burn sites under sterile conditions. Wound healing was monitored weekly over four weeks using the Bates-Jensen Wound Assessment Tool (BJWAT) to track progress.

Results

The patient showed marked improvement in wound healing, with a significant reduction in BJWAT scores over the four-week period. The application of APRP facilitated faster tissue regeneration and healing compared to conventional approaches.

Conclusion

APRP demonstrated potential as an effective adjunctive therapy for burn wound healing, enhancing tissue regeneration and reducing healing time. While the findings are encouraging, further multicenter, randomized controlled trials with larger sample sizes are required to validate its efficacy and generalize its use across various wound types and clinical settings.

Keywords: extracellular matrix; autologous platelet; rich plasma

Introduction

Effective wound healing relies on a complex series of biological and molecular mechanisms, including cell migration, proliferation, extracellular matrix (ECM) deposition, angiogenesis, and tissue remodeling. These processes occur in a highly coordinated manner, involving interactions among various biological and immune systems. Normal wound healing is a dynamic, multistep process involving different cell types appearing at the wound site during specific phases of healing.

Autologous Platelet-Rich Plasma (APRP), a concentrated source of platelets suspended in plasma, is rich in growth factors that play a critical role in tissue repair and regeneration. Platelets release bioactive proteins that attract macrophages, mesenchymal stem cells, and osteoblasts, facilitating the removal of necrotic tissue and promoting regeneration. APRP has been shown to enhance wound healing due to its high concentrations of growth factors, including platelet-derived growth factor (PDGF), transforming growth factor (TGF), vascular endothelial growth factor (VEGF), epidermal growth factor (EGF), and fibroblast growth factor (FGF). These factors significantly accelerate tissue regeneration and healing.

Given its ability to promote cellular proliferation and tissue rejuvenation, APRP is increasingly being utilized as an adjunctive therapy in various medical fields, including plastic surgery. It has shown promise in treating acute and chronic wounds, improving cosmetic outcomes, and managing conditions such as hair loss and tendon injuries.

Materials and Methods

This study was conducted in the Department of Plastic Surgery at a tertiary care center after obtaining ethical committee clearance and informed consent. The patient, a 45-year-old male, presented with second-degree burns involving the face, both upper limbs, and lower limbs following a gas cylinder explosion.

APRP was prepared following the standardized method described by Franco et al. and Li et al. The preparation steps included:

1. Drawing 10 mL of venous blood and mixing it with heparin.
2. Centrifuging the sample at 3000 RPM for 10 minutes to separate plasma layers.
3. Aspirating the upper plasma layer using sterile techniques.
4. Re-centrifuging the aspirated plasma at 4000 RPM for 10 minutes to concentrate platelets in the bottom layer.
5. Extracting the platelet-rich plasma for use.

Under sterile conditions, APRP was infiltrated at the burn sites, followed by compression dressing with an elastocrepe bandage. The affected limbs were elevated to reduce swelling. Wound healing was monitored weekly using the Bates-Jensen Wound Assessment Tool (BJWAT) for four weeks.

Results

The patient demonstrated significant improvement in wound healing, as evidenced by reduced BJWAT scores over four weeks. The use of APRP proved to be a feasible adjunct for burn wound healing, promoting faster tissue regeneration.

Discussion

Wound healing occurs in overlapping phases: inflammation, proliferation, and remodeling. Platelets play a key role, particularly in the initial stages, by releasing growth factors and bioactive molecules. The TIME framework—focused on tissue management, infection control, moisture balance, and epithelial edge advancement—serves as a guideline for effective wound management.

APRP enhances healing by supplying high concentrations of growth factors to the wound bed, promoting angiogenesis, fibroblast differentiation, and epithelialization. Studies suggest that APRP accelerates soft tissue wound healing by two to three times compared to normal healing processes. BJWAT, a reliable wound assessment tool, indicated consistent improvement in wound healing in this study.

Although the findings are promising, the study was conducted on a single patient, limiting the ability to draw definitive conclusions. Further multicenter, randomized controlled trials with larger sample sizes are needed to validate APRP's role in managing burn wounds and other wound etiologies.

Conclusion

APRP shows potential in enhancing burn wound healing and minimizing complications. However, larger-scale studies are necessary to establish its efficacy across various wound types and clinical settings.

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