Platelet-Rich Plasma in Wound and Burn Healing: A Comprehensive Review

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Wound and burn healing remain significant challenges in clinical practice, with high rates of complications and suboptimal outcomes. Platelet-rich plasma (PRP) has emerged as a promising autologous therapy in regenerative medicine. This review explores the current evidence on the efficacy of PRP in promoting wound and burn healing. It examines mechanisms of action, clinical applications, and future research directions. While PRP demonstrates significant potential in enhancing healing outcomes, the lack of standardized protocols remains a critical limitation.

PRP facilitates healing through the release of growth factors such as platelet-derived growth factor (PDGF), vascular endothelial growth factor (VEGF), and transforming growth factor-beta (TGF-β). These factors promote angiogenesis, fibroblast proliferation, and collagen synthesis while modulating inflammation[1]. In wound healing, PRP has shown efficacy in both acute wounds, such as surgical and traumatic injuries, and chronic wounds, including diabetic ulcers and pressure sores. In burn healing, PRP enhances epithelialization in partial-thickness burns and serves as an adjunct to skin grafts in full-thickness burns. In addition, PRP reduces healing time, infection rates, and adverse events and improves scar quality. However, variations in preparation methods and study designs complicate direct comparisons[2–4].

PRP has also been utilized in reconstructive surgeries, where it enhances graft integration and minimizes donor site complications. Moreover, it has demonstrated promise in treating venous leg ulcers, arterial ulcers and radiation-induced skin injuries—conditions that often resist conventional treatments. Emerging evidence suggests that combining PRP with other regenerative therapies, such as stem cells and bioengineered scaffolds, may maximize its therapeutic potential[4–6].

Despite its promise, the lack of standardization in PRP preparation and application remains a significant challenge. Variability in centrifugation protocols, the inclusion of leukocytes, platelet concentration levels, and activation methods all contribute to inconsistent results across studies. Additionally, the characterization of PRP as pure PRP (P-PRP), leukocyte-rich PRP (L-PRP), or platelet-rich fibrin (PRF) significantly influences its biological activity and clinical outcomes. Optimal dosing and frequency of PRP application are also not well-defined, with existing studies often utilizing disparate methodologies[7].

Regulatory challenges further complicate the standardization process. While PRP is considered an autologous product and thus exempt from many regulatory hurdles, differences in how it is classified and regulated across countries can hinder its adoption in routine clinical practice. Economic factors, including the cost of PRP preparation systems and the lack of reimbursement policies in many healthcare settings, also pose significant barriers to widespread use. Addressing these challenges requires a concerted effort to develop evidence-based guidelines and establish consensus on preparation and application protocols.

PRP represents a promising therapy for wound and burn healing, offering benefits in tissue regeneration and scar quality. However, standardization of protocols and validation of long-term efficacy remain paramount to fully realizing its potential.

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