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Autologous Blood Clot Therapy as a Wound Regenerative Technique in Burns

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ABSTRACT

Burn injuries significantly impair the skin's barrier function, leading to prolonged healing times, increased susceptibility to infections, and scarring. Autologous blood clot (ABC) therapy has emerged as a promising regenerative approach, utilizing the patient's own blood components to enhance wound repair. This review explores the mechanism of action, preparation, clinical applications, benefits, and challenges of ABC therapy in burn wound management. Recent studies suggest that ABC therapy enhances angiogenesis, modulates inflammation, and accelerates re-epithelialization, thereby improving healing outcomes. Standardization of preparation techniques and further clinical trials are essential to optimize its efficacy.

Keywords:

Autologous Blood Clot, Burn Wound Healing, Regenerative Medicine,Growth Factors, Tissue Regeneration

Introduction

Burn injuries result in extensive tissue damage, posing significant challenges to wound healing. Conventional management strategies, including skin grafting, synthetic dressings, and enzymatic debridement, often fall short in promoting rapid and complete tissue regeneration [1]. Autologous blood clot therapy has recently gained attention for its ability to enhance wound healing by utilizing the body's natural regenerative mechanisms. ABC therapy harnesses the coagulation process to create a biologically active scaffold rich in fibrin, platelets, leukocytes, and growth factors that support cellular proliferation and tissue repair [2]. This review examines ABC therapy in burn wound healing, its preparation, biological mechanisms, clinical applications, and potential challenges.

Preparation of Autologous Blood Clot (fig 1)

The preparation of ABC follows a standardized protocol, ensuring consistency and effectiveness. According to Snyder et al. (2024), the process involves the following steps:

1. Blood Collection: Approximately 10–20 mL of the patient's venous blood is drawn into a sterile, anticoagulant free tube to allow for natural clot formation.

2. **Incubation and Coagulation:** The blood sample is left undisturbed at room temperature for 30–60 minutes, enabling clot formation through natural coagulation pathways.

3. **Clot Extraction:** The formed clot is carefully separated from the residual serum and prepared for application.

The clot retains key components, including fibrin, platelets, and growth factors, which are essential for wound healing.

4. **Application to Wound Site:** The autologous clot is directly placed over the wound bed, ensuring even coverage. (fig 2) A secondary dressing is applied to maintain moisture and protect the clot from mechanical disruption.

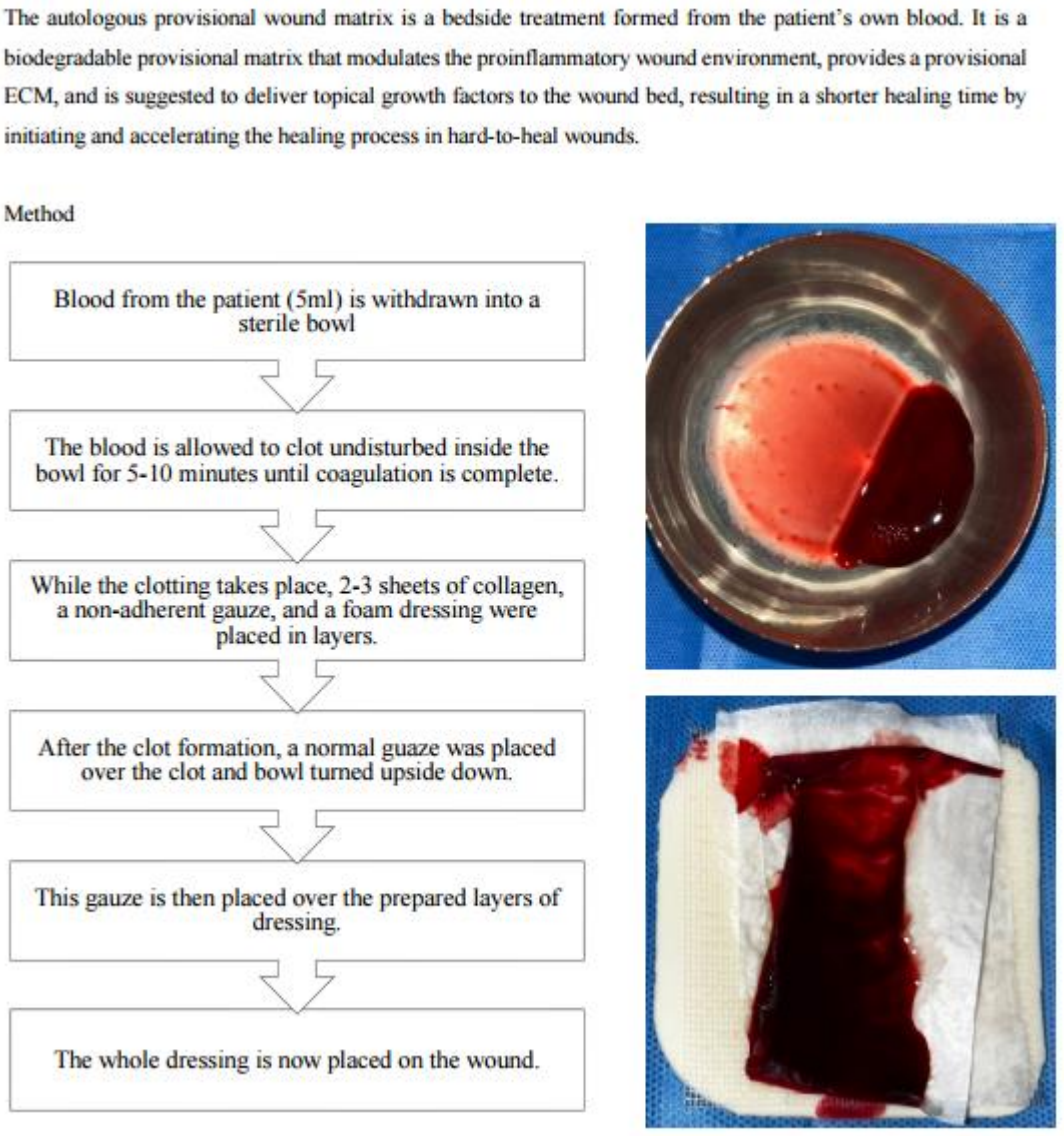

Fig 1 Preparation of Autologous Blood Clot

Fig 2 application of autologous blood clot

Mechanism of Action in Burn Wound Healing

ABC therapy enhances burn wound healing through multiple biological mechanisms:

- **Hemostasis and Structural Support:** The fibrin matrix provides mechanical stability to the wound, preventing excessive bleeding and serving as a scaffold for cell attachment and migration [4].
- **Cellular Proliferation and Migration:** Growth factors such as platelet-derived growth factor (PDGF) and transforming growth factor-beta (TGF-β) stimulate fibroblast proliferation and extracellular matrix production [5].
- **Angiogenesis:** Vascular endothelial growth factor (VEGF) promotes new capillary formation, enhancing blood supply and oxygenation to the wound site [6].
- **Inflammatory Modulation:** Leukocytes within the clot release cytokines that regulate the inflammatory response, reducing excessive tissue damage while promoting immune defense [7].

Clinical Applications in Burn Management

ABC therapy has demonstrated efficacy in treating various chronic wounds, including diabetic foot ulcers, venous ulcers, and pressure sores [8]. In burn wound healing, ABC therapy serves as an adjunct to conventional treatments, accelerating epithelialization and reducing infection rates. Clinical studies have reported improved healing outcomes in partial-thickness and full-thickness burns treated with ABC compared to standard dressings [9].

Advantages of ABC Therapy in Burns

- Autologous Nature: This reduces the risk of immune rejection and allergic reactions [10].
- Enhanced Tissue Regeneration: Growth factors within the clot promote cell proliferation and matrix remodeling [11].
- Angiogenesis Stimulation: VEGF and PDGF encourage new blood vessel formation, improving nutrient supply [12].
- Reduced Infection Risk: Leukocytes within the clot provide antimicrobial properties, reducing bacterial colonization [13].
- Cost-Effectiveness: Compared to bioengineered skin substitutes, ABC therapy is a cost-effective alternative, particularly in resource-limited settings [14].

Limitations and Challenges

Despite its advantages, ABC therapy faces several challenges:

- Variability in Clot Composition: Individual patient factors, including blood composition and comorbidities, may affect the clot's regenerative potential [15].
- Risk of Contamination: Strict aseptic techniques are necessary during preparation and application to prevent infections [16].
- Lack of Standardization: Currently, there is no universally accepted protocol for ABC therapy in burn care, necessitating further research and clinical trials [17].

Future Directions

To enhance ABC therapy's effectiveness, future research should focus on:

1. **Standardization of Preparation Techniques:** Establishing uniform protocols for ABC preparation and application [18].
2. **Integration with Other Regenerative Therapies:** Combining ABC therapy with platelet-rich plasma (PRP), mesenchymal

stem cells, or bioengineered scaffolds to optimize healing [19].

3. **Clinical Trials in Burn Management:** Conducting large-scale randomized controlled trials to validate ABC therapy's long-term efficacy in burn wound healing [20].

Conclusion:

Autologous blood clot therapy offers a promising, cost-effective, and biologically active approach to burn wound healing. By utilizing the body's natural healing mechanisms, ABC therapy enhances tissue repair, reduces complications, and improves overall recovery in burn patients. While challenges remain in standardization and variability, further advancements in regenerative medicine will refine ABC therapy, making it a valuable tool in modern burn care strategies.

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