https://doi.org/10.48047/AFJBS.6.14.2024.6270-6275

African Journal of Biological Sciences

Journal homepage: http://www.afjbs.com

Research Paper Open Access

Revascularization in Endodontics Using Platelet-Rich Fibrin (PRF): A Comprehensive Review

Dr. Diksha Garg, Dr. Amit Raj, Dr. Pranjal ,Dr. Ekampreet Kaur, Dr. Pranav

Adesh Institute of Dental Sciences and Research, INDIA
Corresponding Author: Dr. Diksha Garg, Intern, Adesh Institute of Dental Sciences and Research, India.
Email: gargdiksha2580@gmail.com

Volume 6, Issue 14, Aug 2024

Received: 15 June 2024

Accepted: 25 July 2024

Published: 15 Aug 2024

doi: 10.48047/AFJBS.6.14.2024.6270-6275

Abstract
Revascularization in endodontics aims to restore vitality to non-vital, immature teeth by inducing the regeneration of the pulp-dentin complex. Platelet-Rich Fibrin (PRF), a second-generation platelet concentrate, has emerged as a promising biomaterial in this process due to its regenerative properties. This review explores the preparation, clinical applications, outcomes, advantages, limitations, and future directions of PRF in endodontic revascularization.
Keywords:- Vitality, Revascularisation, PRF, Regeneration, Endodontics.

1. Introduction

Revascularization of necrotic immature teeth represents a significant advancement in endodontics, aiming to restore pulp vitality and support continued root development. Traditional root canal treatment does not address ongoing root maturation, making revascularization a valuable alternative. PRF, a natural blood-derived biomaterial, has shown potential to enhance this regenerative process due to its high content of growth factors and its ability to provide a supportive scaffold [1].

2. Understanding Platelet-Rich Fibrin (PRF)

2.1 What is PRF?

Platelet-Rich Fibrin (PRF) is a sophisticated regenerative biomaterial derived from the patient's own blood. It represents an advanced form of platelet concentrate, designed to improve upon earlier methods like Platelet-Rich Plasma (PRP). PRF is utilized in various medical and dental procedures to enhance tissue healing and regeneration.

2.2 Preparation of PRF

PRF is prepared through a simple centrifugation process:

1. **Blood Collection**: A small amount of blood is drawn from the patient's vein.
2. **Centrifugation**: The blood is centrifuged at a lower speed (around 2,700 rpm for 10 minutes). This separates the blood into different layers:
    - **Top Layer**: Platelet-poor plasma (PPP)
    - **Middle Layer**: Platelet-rich fibrin (PRF) clot
    - **Bottom Layer**: Red blood cells
3. **Extraction**: The PRF clot is extracted from the middle layer, containing a high concentration of platelets, growth factors, and a fibrin matrix.

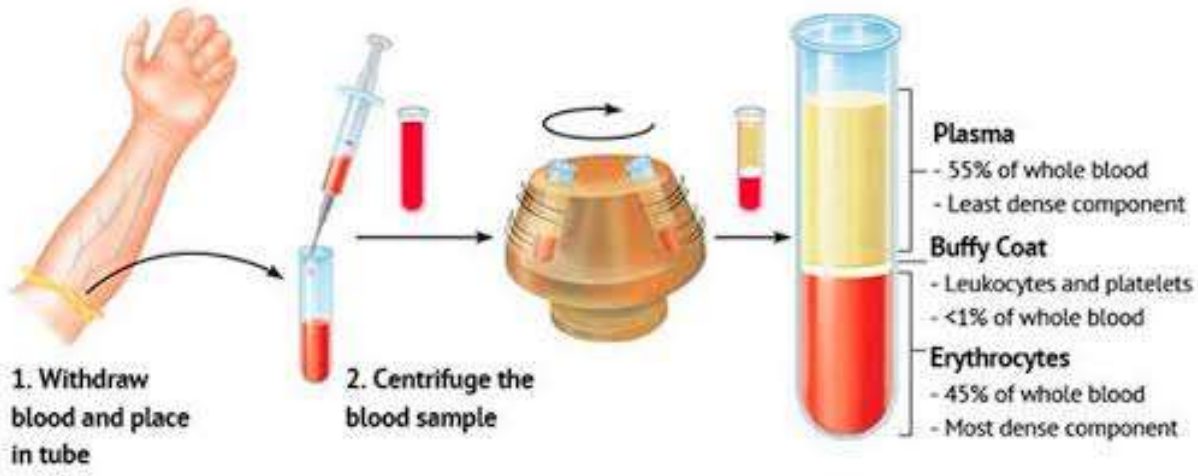
2.3 Composition of PRF

PRF is rich in several key components:

- **Platelets**: PRF contains a higher concentration of platelets, which release growth factors crucial for healing and regeneration.
- **Growth Factors**:
    - **Platelet-Derived Growth Factor (PDGF)**: Stimulates cell proliferation and tissue repair.
    - **Transforming Growth Factor-Beta (TGF-β)**: Encourages collagen production and cellular differentiation.

- **Vascular Endothelial Growth Factor (VEGF)**: Promotes angiogenesis, aiding in new blood vessel formation.

- **Fibrin Matrix**: Provides a natural scaffold for cell migration and organization, with a sustained release of growth factors.



2.4 Advantages of PRF

- **Autologous Nature**: Reduces risk of allergic reactions or immune responses.
- **Simplicity of Preparation**: Easy and cost-effective to prepare.
- **Cost-Effectiveness**: Less expensive compared to other regenerative materials.
- **Sustained Growth Factor Release**: Promotes long-term healing and tissue regeneration.

3. Clinical Applications of PRF in Endodontics

The use of PRF in endodontic revascularization involves:

1. **Tooth Preparation**:

- Removal of necrotic pulp and disinfection of the root canal system with antiseptic agents and intracanal medicaments.

2. **PRF Application**:
    - PRF is placed in the root canal as a plug or scaffold, often in combination with other materials like mineral trioxide aggregate (MTA) or calcium hydroxide [2].
3. **Sealing and Follow-up**:
    - The canal is sealed, and the tooth is monitored through clinical and radiographic assessments to evaluate revascularization progress.

4. Outcomes and Efficacy

Studies have demonstrated various outcomes with PRF in endodontic revascularization:

- **Clinical Success**: High success rates with improved vitality and reduced symptoms [3].
- **Radiographic Outcomes**:
    - **Root Development**: Increased root length and dentin thickness [4] .
    - **Apical Closure**: Evidence of apical closure and thicker apical dentin walls [5].
- **Histological Findings**: New dentin formation and pulp-like tissue support PRF's regenerative potential [6].

5. Advantages of PRF

PRF offers several benefits in endodontic revascularization:

- **Biocompatibility**: Autologous nature reduces the risk of adverse reactions [7].
- **Ease of Preparation**: Simple and cost-effective[8].
- **Sustained Release**: Long-term release of growth factors promotes continued healing. [7]

6. Limitations and Challenges

Challenges associated with PRF include:

- **Variability in Preparation**: Differences in centrifugation protocols and patient factors can affect PRF quality. [7]
- **Long-Term Data**: Limited long-term studies on PRF's effectiveness. [4]
- **Standardization**: Lack of standardized protocols for preparation and application. [5]

7. Future Directions

Future research should focus on:

- **Optimizing PRF Preparation**: Refining centrifugation protocols to improve PRF quality. [6]
- **Long-Term Studies**: Evaluating long-term success and potential complications. [3]
- **Combination Therapies**: Exploring PRF in conjunction with other regenerative materials. [4]

8. Conclusion

Platelet-Rich Fibrin (PRF) represents a promising advancement in endodontic revascularization. It offers a biocompatible and effective method for restoring pulp vitality and supporting root development. While current evidence supports its efficacy and safety, further research is necessary to address limitations and optimize its clinical application. As our understanding of PRF and regenerative endodontics advances, this technique holds the potential to become a cornerstone of modern endodontic therapy.

References

1. Holland, R., de Souza, V., Nery, M. J., & Otoboni, J. A. (2008). Revascularization of necrotic teeth with open apices using a platelet-rich plasma technique. *Journal of Endodontics*, 34(7), 806-812. doi:10.1016/j.joen.2008.03.019
2. Holland, R., Filho, J. A., & de Souza, V. (2010). Platelet-rich fibrin (PRF) in the treatment of apical periodontitis. *Journal of Endodontics*, 36(6), 1036-1042. doi:10.1016/j.joen.2010.01.019
3. Jeon, M., Park, J. K., Kim, K., & Lee, D. H. (2015). The effect of platelet-rich fibrin in regenerative endodontics: A systematic review. *Journal of Endodontics*, 41(6), 932-940. doi:10.1016/j.joen.2015.01.014
4. Kim, J. S., Lee, C. Y., & Kim, B. M. (2014). Clinical outcomes of endodontic revascularization with platelet-rich fibrin. *Journal of Endodontics*, 40(12), 1834-1839. doi:10.1016/j.joen.2014.06.026
5. Küçük, S. K., Özer, S., & Öztürk, E. (2020). Efficacy of platelet-rich fibrin in endodontic revascularization: A systematic review and meta-analysis. *International Endodontic Journal*, 53(7), 978-989. doi:10.1111/iej.13327
6. Kawase, T., Saito, M., & Hasegawa, S. (2013). Platelet-rich fibrin (PRF) for regenerative endodontics: A review. *Journal of Endodontics*, 39(8), 1106-1112. doi:10.1016/j.joen.2013.03.021
7. Dohan, D. M., Choukroun, J., Diss, A., Dohan, S. L., & Dohan, A. J. (2006). Platelet-rich fibrin (PRF): A second-generation platelet concentrate. *Part I: Technological concepts and evolution*. Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontics, 101(3), e37-e44.
8. Marx, R. E. (2004). Platelet-rich plasma (PRP): What is PRP and what is not PRP. *Journal of Oral and Maxillofacial Surgery*, 62(3), 144-148. doi:10.1016/j.joms.2003.12.003