



Salvage Through Endodontic and Periodontal Management – A Bold ACT.

P. Veerendra Nath Reddy¹, A. Soujanya², Chavva Lakshmi Charan Reddy³, K. PhaniYasaswini⁴

¹Professor, Department of Periodontics, Panineeya Institute of Dental Sciences and Research Centre, Hyderabad, Telangana, India.

²Post Graduate Student, Department of Prosthodontics, Panineeya Institute of Dental Sciences and Research Centre, Hyderabad, Telangana, India.

³Senior Lecturer, Department of Conservative dentistry and Endodontics, Panineeya Institute of Dental Sciences and Research Centre, Hyderabad, Telangana, India.

⁴Senior Lecturer, Department of Periodontics, MNR Dental College and Hospital, Sangareddy, Telangana, India

Conflicts of Interest: Nil

Corresponding author: Chavva Lakshmi Charan Reddy

DOI: <https://doi.org/10.32553/ijmsdr.v6i2.921>

Abstract:

Periapical surgery is an important treatment alternative in the presence of a large periapical cyst. To achieve regeneration and optimal healing of the bone different bone substitutes can be used. A 25 year old male patient reported with the chief complaint of mobile teeth in maxillary anterior tooth region with 21 labially placed. He had a history of trauma 5 years back. The clinical and radiographic diagnosis of infected periapical cyst with 21,22; Endodontic treatment was performed with 21, 22 followed by periapical curettage. Platelet rich fibrin (PRF) was mixed with Metronidazole gel and used as a regenerative biomaterial in the periapical defect. 6 months follow up shows satisfactory healing and regeneration of periapical region. There is considerable clinical interest in using PRF in combination with Metronidazole Gel. In conclusion, the results of the present study indicate that metronidazole gel along with PRF has a beneficial effect on healing of periapical defects.

Keywords: Growth factor, Platelet rich fibrin, Regeneration.

Introduction:

The purpose of periapical surgery is to Completely remove all pathological tissue from the lesion (root canal, soft tissue and bone).[1]

Regeneration of periapical bone defects endure to present formid able challenges to the endodontists.[2] Especially in cases of large periapical boned effects or through and through lesions, conventional surgery results in less predictable healing with extensive fibrous

connective tissue fill that is unreliable repair.[3]

Adopting a patient's own regenerative tools for bone regeneration is a comparatively new approach as vehicles for growth factor (GF) delivery are continually amend for preclinical and clinical applications. Recently tissue engineering has gained attraction in different fields such as sports medicine, orthopedics, periodontics, oral and maxillofacial surgery,

implantology etc. to accelerate bone regeneration.[2]

Platelet rich fibrin (PRF) was evolved in France by Choukroun J *et al.*, 2001. It is a second generation platelet concentrate extensively used to accelerate hard and soft tissue healing. Its advantages over the superior known platelet rich plasma (PRP) include ease of preparation/application, minimal expense and lack of biochemical modification that is no bovine thrombin or anticoagulant is required, sustained release of GF over a longer period of time.[4]

The scientific hypothesis behind the use of these preparations lies in the fact that the platelet α granules are a reservoir of many GF that are known to play a compelling role in soft and hard tissue repair mechanism. PRF is a strictly autologous fibrin matrix containing a large quantity of leucocyte and platelet cytokines.[5]

Clinical data concede that this biomaterial would be a favorable matrix for the development of a coherent healing without inflammatory excess.[6]

The developing awareness of the role of obligate anaerobic bacteria in the etiology of oral disease has led to a significance in their chemotherapeutic control. Many drugs are efficient at eliminating anaerobes but in instances where these bacteria are acting as sole or major pathogens it is enticing to remove these specifically. The nitroimidazole group of drugs is specifically anti-anaerobic in nature and includes tinidazole, metronidazole and nimorazole.

Metronidazole has been proved to be adequate in treating: pericoronitis, acute ulcerative gingivitis, certain periapical infections, some cases of osteomyelitis and infected socket. The drug may be of use in cases of chronic progressive periodontitis where anaerobes are involved as pathogens.[7]

In this case, Regenerative periapical surgery using PRF and Metronidazole Gel has been attempted to overcome the disadvantage of unreliable repair in conventional surgery and achieve optimal and accelerated soft- and hard tissue healing.

II. Case Report

A 32-year-old male patient reported with the chief complaint of pain in upper front region since one month. He had a history of trauma 2 years back. Clinically 21,22 were discolored with 21 placed labially. Upon radiographic evaluation, large periapical radiolucencies were seen at the apex of 21,22.[Figure:1]. Furthermore the radiolucency was seen in the cervical region of 22 and the middle- third of root canal with 21 [Figure 2]. The clinical and radiographic diagnosis was infected periapical cyst with 21,22; Multiple visit endodontic treatment was performed with 21,22 with calcium hydroxide placed as an intra canal medicament for 2 weeks. [Figure 3,4,5]. Obturation of 11 was carried out with thermo plasticized gutta-percha technique to fill the irregularities of internal resorption defect and that of 21 was carried out with cold lateral compaction [Figure 6,7]. For the surgical procedure, labial rectangular [Figure 8] full thickness mucoperiosteal flap was raised. Labially the bony window was enlarged, and curettage of the cyst lining was carried out [Figure 9]. The cervical resorption defect was debrided with the help of curettes. The regenerative biomaterial used here is PRF. PRF was mixed with Metronidazole Gel and the combination was placed in the bony defect [Figures 10, 11] and labial sutures were placed [Figure 12]. Post-operatively antibiotics, Augmentin (combination of Amoxicillin and Clavulanate potassium) 625 mg tablet every 8 hourly for 5 days and anti-inflammatory drug i.e., Enzoflam (combination of Diclofenac, Paracetamol (Acetaminophen) and Serratio peptidase) 8 hourly for 3 days were prescribed. The patient was followed-up after 1,3 and 6 months.

Six months follow-up radiograph shows satisfactory bone fill in the periapical area [Figure 13]. Procedure for preparation of PRF 40 ml of patient's blood was collected without any anticoagulant and immediately centrifuged at 3400 rpm for 18 min. The result was a fibrin clot containing the platelets located in the middle of the tube, just between the red blood cell layer at the bottom and a cellular plasma at the top. This clot was removed from the tube and the attached red blood cells scraped off and discarded. Then PRF was mixed with Metronidazole Gel and combination placed in the defect.

III. Discussion

The understanding of how normal wound healing and tissue formation occurs together with recent advances in materials science, stem cell research and developmental biology have helped to find target molecules and pathways, which can restore a patient's regenerative capacity.[2]

PRF is a matrix of autologous fibrin, in which are embedded a large quantity of platelet and leukocyte cytokines during centrifugation. Platelet α (α) granules for man intra cellular storage pool of GF including platelet derived growth factor (PDGF), transforming growth factor- β (TGF- β , including β -1 and β -2-isomers), vascular endothelial growth factor (VEGF), and epidermal growth factor.[5] Platelet GF exhibit chemotactic and mitogenic properties that promote and modulate cellular functions involved in tissue healing and regeneration and cell proliferation.[8] Insulin-like growth factor-1 (IGF-1), which is present in plasma, can exert chemotactic effects towards human osteoblasts.[9]

PRF contains all key immune cytokines such as interleukins IL1 β , IL-6, IL-4 and tumour necrosis factor. PRF has a supportive effect on the immune system because it is able to stimulate defense mechanisms. This could be important in the case of wound infection.[10]

PRF may act as a supportive matrix for bone morphogenetic proteins as well-Kawamura and Urist.[11]

Though platelets and leukocyte cytokines play an important part in the biology of this biomaterial, the fibrin matrix supporting them certainly constitutes the determining element responsible for the real therapeutic potential of PRF.[12] A progressive polymerization mode signifies increased incorporation of the circulating cytokines the fibrin meshes. This result would imply that PRF, unlike the other platelet concentrates would be able to release cytokines during fibrin matrix remodelling i.e., when they have to be stimulated to launch injured site reconstruction that is it has a long term effect.[6] According to Simonpieri [13] et.al., the use of this platelet and immune concentrate during bone grafting offers the following 4 advantages:

First, the fibrin clot plays an important mechanical role maintaining and protecting the bone grafts and serving as biological connectors between bone particles.

Second, the integration of this fibrin network into the regenerative site facilitates cellular migration, particularly for endothelial cells necessary for the neo-angiogenesis,[14] vascularisation and survival of the graft.

Third, the platelet cytokines (PDGF, TGF- β , IGF1) are gradually released as the fibrin matrix is resorbed, thus creating a perpetual process of healing.[15,16]

Lastly, the presence of leukocytes and cytokines in the fibrin network can play a significant role in the self-regulation of inflammatory and infectious phenomena within the grafted material.

Metronidazole was developed to be an effective anti-trichomonal agent, its most interesting property, from the point of view of clinical dentistry, is its specific action against anaerobic bacteria (Finegold 1977b). It is now accepted that the vast majority of anaerobic

and photosynthetic bacteria are susceptible to the drug. Metronidazole is bactericidal for these organisms at relatively low concentrations (0.1-25 ng/m³).[7]

In the present study the application of metronidazole along with PRF at the target site appeared to be effective in providing improved conditions for the periodontal tissues to regenerate, albeit bacteria were present in the wound.[17] The advantage of the local treatment with metronidazole over the systemic treatment is the high concentration

which can be obtained at the target site and the low plasma concentrations.[18]

In this case, the radiograph reveals satisfactory bone regeneration after 6 months.

IV. Conclusion

Thus, it can be concluded that PRF along with Metronidazole Gel is a healing biomaterial, as it features all the necessary parameters permitting optimal wound healing. Long-term follow-up of the case is essential to evaluate the treatment outcome



Figure 1

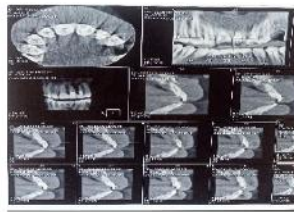


Figure 2



Figure 3



Figure 4



Figure 5



Figure 6



Figure 7



Figure 8



Figure 9



Figure 10



Figure 11



Figure 12



Figure 13

References

1. Bogdan Petrov Krastev *et al.*, Periapical Surgery. Review. Classic vs Modern Concepts. *International Journal of Medical Reviews and Case Reports* (2019) 3(12):865-872.
2. Chen FM, Zhang J, Zhang M, An Y, Chen F, Wu ZF. A review on endogenous regenerative technology in periodontal regenerative medicine. *Biomaterials* 2010;31:7892-927.
3. Pecora G, De Leonardis D, Ibrahim N, Bovi M, Cornelini R. The use of calcium sulphate in the surgical treatment of a 'through and through' periradicular lesion. *Int Endod J* 2001;34:189-97.
4. Toffler M, Toscano N, Holtzclaw D, Corso MD, Ehrenfest DD. Introducing Choukroun's Platelet Rich Fibrin (PRF) to the Reconstructive Surgery Milieu. *J Implant Adv Clin Dent* 2009;1:21-32.
5. Su CY, Kuo YP, Tseng YH, Su CH, Burnouf T. In vitro release of growth factors from platelet-rich fibrin (PRF): A proposal to optimize the clinical applications of PRF. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2009;108:56-61.
6. Choukroun J, Diss A, Simonpieri A, Girard MO, Schoeffler C, Dohan SL, Dohan AJ, Mouhyi J, Dohan DM. Platelet-rich fibrin (PRF): A second-generation platelet concentrate. Part V: histologic evaluations of PRF effects on bone allograft maturation in sinus lift. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2006;101:299-303.
7. Mitchell, D. A. (1984). Metronidazole: its use in clinical dentistry. *Journal of Clinical Periodontology*, 11(3), 145-158.
8. Anitua E, Sánchez M, Orive G, Andía I. The potential impact of the preparation rich in growth factors (PRGF) in different medical fields. *Biomaterials* 2007;28:4551-60.
9. Lind M. Growth factor stimulation of bone healing. Effects on osteoblasts, osteomies, and implants fixation. *Acta Orthop Scand Suppl* 1998;283:2-37.

10. Dohan DM, Choukroun J, Diss A, Dohan SL, Dohan AJ, Mouhyi J, et al. Platelet-rich fibrin (PRF): A second-generation platelet concentrate. Part II: Platelet-related biologic features. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2006;101:e45-50.
11. Kawamura M, Urist MR. Human fibrin is a physiologic delivery system for bone morphogenetic protein. *Clin Orthop Relat Res* 1988;235:302-10.
12. Choukroun J, Diss A, Simonpieri A, Girard MO, Schoeffler C, Dohan SL, et al. Platelet-rich fibrin (PRF): A second-generation platelet concentrate. Part IV: Clinical effects on tissue healing. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2006;101:e56-60.
13. Simonpieri A, Del Corso M, Sammartino G, Dohan Ehrenfest DM. The relevance of Choukroun's platelet-rich fibrin and metronidazole during complex maxillary rehabilitations using bone allograft. Part II: Implant surgery, prosthodontics, and survival. *Implant Dent* 2009;18:220-9.
14. Dohan DM, Choukroun J, Diss A, Dohan SL, Dohan AJ, Mouhyi J, et al. Platelet-rich fibrin (PRF): A second-generation platelet concentrate. Part I: Technological concepts and evolution. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2006;101:e37-44.
15. Simonpieri A, Del Corso M, Sammartino G, Dohan Ehrenfest DM. The relevance of Choukroun's platelet-rich fibrin and metronidazole during complex maxillary rehabilitations using bone allograft. Part I: A new grafting protocol. *Implant Dent* 2009;18:102-11.
16. Berglundh T, Lindhe J. Healing around implants placed in bone defects treated with Bio-Oss. An experimental study in the dog. *Clin Oral Implants Res* 1997;8:117-24.
17. Frandsen EVG, Sander L, Arnbjerg D, Theilade E. Effect of local metronidazole application on periodontal healing following the guided tissue regeneration procedure. Microbiological findings. *J Periodontol* 1994; 65:921-928.
18. Stoltze K, Stellfeld M. Systemic absorption of metronidazole after application of metronidazole 25% dental gel. *J Clin Periodontol* 1992; 19:693-697.