International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2015): 78.96 | Impact Factor (2015): 6.391

# Platelet-Rich Fibrin: A Boon for the Treatment of Endodontic-Periodontic Lesions

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**Abstract:** ***The aim of periodontal therapy is to restore form and function of the periodontium to its healthy state. The various platelet derived growth factors exert a favorable effect on wound healing. Platelet-rich fibrin (PRF) membrane provides a nidus for such growth factors, accelerating the process of wound healing. In the following case report, PRF membrane along with hydroxyapatite particles as bone graft was used for the treatment and regeneration of deep periodontal defect resulting in faster healing and significant bone fill. Thus PRF appears as a natural and satisfactory alternative with potent results and low risk in various periodontal regenerative procedures.***

**Keywords:** Endodontic-periodontic lesion. Bone defect, Platelet-rich Fibrin, Periodontal regeneration, Growth factor

## 1. Introduction

Periodontal disease is a complex multifactorial disease that causes loss of connective tissue attachment and periodontal tissue destruction [1]. Thus the main objectives of periodontal therapy are elimination of the ongoing inflammatory process, preventing the further progression of periodontal disease and also to regenerate the lost periodontal tissues destroyed by the periodontal disease [1].

Numerous external factors can cause initiation of various pulpal or periradicular diseases that may include micro-organisms, trauma, excessive heat, restorative procedures, regenerative agents and malocclusion [2]. An endodontic-periodontic lesion occurs as a result of invasion of periodontal tissues by various endodontic pathogens of the necrotic infected pulp, through the accessory canals or functional canals, resulting in inflammation of the periodontal tissues [3].

If left Untreated or unresolved, infection of endodontic origins act as a nidus for growth of various endodontic pathogens leading to sequele of events including additional pocket formation, increased bone loss, calculus deposition, osteoclastic activity, subsequent bone and tooth resorption [4]. Thus appropriate diagnosis, identification of the cause and proper treatment planning are crucial for the treatment to restore the form and function of the tooth.

Various complex biologic events like cell adhesion, migration, proliferation & differentiation occur in an orchestrated sequence in the process of periodontal regeneration [1]. The wound healing requires the interactions between various periodontal cells such as epithelial cells, gingival fibroblasts, periodontal ligament cells and osteoblasts[5].

The disruption of vasculature during wound healing causes fibrin formation, aggregation of platelets and also release of several growth factors from platelets [5]. The presence of these growth factors and cytokines in platelets mediate the process of inflammation and wound healing [6].

Platelet-rich Fibrin is a second-generation platelet concentrate that has high platelet concentration and growth factors [7]. The platelets secrete fibrin, fibronectin and vitronectin, which acts as a matrix for the connective tissue and also helps in more efficient cell migration [4]. This has led to the concept of using platelets as useful therapeutic tool to enhance the tissue healing process particularly in periodontal wound healing.

This case report is an attempt that to focus on regenerative capacity of lesion with bone graft and PRF.

## 2. Case Report

A 27 year male patient reported to the Department of Periodontics with the chief complaint of discoloured tooth and pain in the upper anterior tooth region. Dental history revealed trauma to the same region. On intraoral examination, the tooth was found sensitive to percussion with Grade I mobility and pocket in the affected tooth, with no pus discharge or sinus tract. Radiographic evaluation showed periapical lesion at the apex of left maxillary central incisor (Figure 1).

**Figure 1:** Pre-operative radiograph showing bone defect around maxillary left incisor after root canal treatment.

## 3. Presurgical Therapy

The patient was systemically healthy with no contraindication of periodontal therapy. The initial phase of the treatment included complete scaling and root planing. The patient was then referred to the department of Endodontics for the root canal treatment of the maxillary left central incisor. The oral hygiene instructions were given to the patient to be followed throughout the procedure. After completion of the initial phase of the therapy, the patient was re-evaluated after which the surgical procedure was carried out.

## 4. Surgical Procedure

The full thickness mucoperiosteal flap was reflected at the site to restore the form and function of the tooth. The surgical procedure was carried out under local anesthesia. Two releasing vertical incisions were given at the line angles of the maxillary central incisors extending beyond the mucogingival junction (Figure 2) followed by intracrevicular incision and interdental incision. Since midline diastema was present in the patient, papilla preservation technique was employed to preserve the interdental papilla between the maxillary central incisors. The muco-periosteal flap was raised taking care to preserve the maximum possible level of marginal and interdental gingiva (Figure 3). The area was curetted carefully removing all the granulation tissue. The surgical area was then rinsed with copious amount of sterile saline. The bone defect could be seen around the apex of the left maxillary central incisor. Slight rounding of the root apex was done followed by thorough debridement and irrigation after which root biomodification was done with tetracycline (Figure 4).

**Figure 2:** Vertical insision

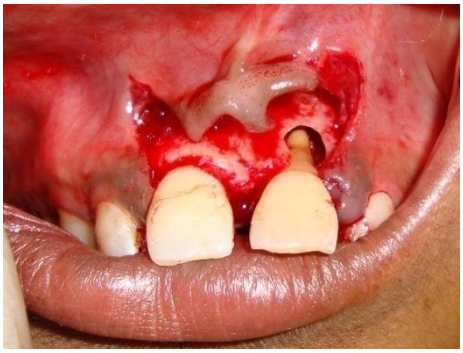


**Figure 3:** Flap raised. The bone defect could be seen around the maxiilary lest incisor.

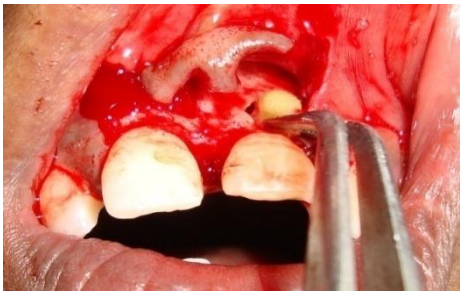
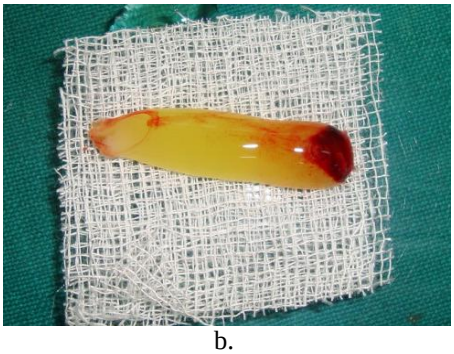


**Figure 4:** Root biomodification with tetracycline

To prepare the PRF, the blood is drawn from the vein and transferred to the 10 ml test tube without any anticoagulant. This is then centrifuged immediately at 2700 rpm for 12 minutes to obtain the PRF, which appears as a supernated solution (Figure 5a, 5b).

a.



b.

**Figure 5a, b**

Presuturing was done so that flap closure can be done immediately after graft and membrane placement (Figure 6). This ensures proper immobilization of the graft material. After presuturing, bone graft was tightly packed into the defect to the level of the surrounding bony walls (Figure 7), over which the PRF membrane was secured (Figure 8) and the flap was sutured immediately with interrupted sutures over which the periodontal dressing was placed (Figure 9a, Figure 9b).

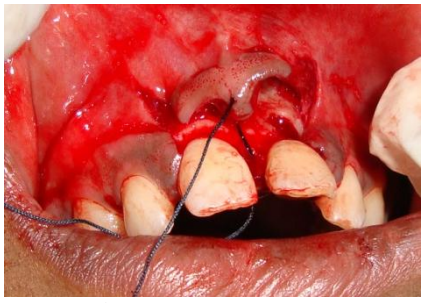


**Figure 6:** Pre-suturing.

**Figure 7:** Bone graft placement

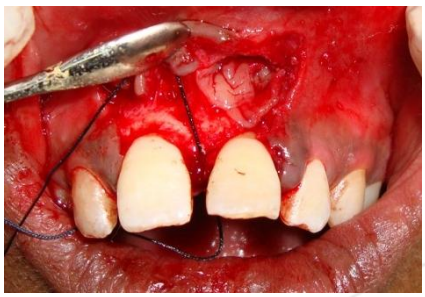


**Figure 8:** PRF membrane placement

**Figure 9a:** Suturing

**Figure 9b:** CoE-Pak placement

Antibiotics and nonsteroidal anti-inflammatory drugs were prescribed for the next 5 days along with post-operative instructions. Oral hygiene instructions were explained to the patient and instructed to rinse the mouth with 0.2% of chlorhexidine gluconate, twice a day. After 1 week, Periodontal dressing and the sutures were removed and the area was reevaluated.

## 5. Result

Patient was reviewed at 1 month, 3 month and 6 month period during which there were no symptoms of pain, inflammation, or discomfort. Clinical examination showed absence of pocket and loss of mobility in the maxillary left lateral incisor. The postoperative radiograph after 6 months shows bone fill and excellent healing around the tooth. (Figure 10a, Figure10b).

**Figure 10 a:** Post-operative view

**Figure 10 b:** Post-operative radiograph showing bone fill

## 6. Discussion

Periodontal disease is one of the most prevalent diseases affecting the people all around the globe [8]. Its clinical characteristics include gingival inflammation, periodontal pocket formation, loss of attachment and loss of alveolar bone around the affected tooth [8]. Thus the goal of any periodontal therapy is to prevent the progression of periodontal disease and also to restore it back to its pre-disease state to maintain the natural dentition in health and comfortable function [9].

The initiation of various Pulpal and periradicular diseases could be because of various external factors which may include microorganisms, trauma, excessive heat, restorative procedures, restorative agents and malocclusion [2]. Such exposures cause initiation of various inflammatory changes in the pulp, starting as reversible or irreversible pulpitis which progresses to Pulpal necrosis and finally leading to breakdown of periodontium [2].

Any changes in the bacterial content of the biofilm or the local invasion of cardiogenic bacteria causes varying inflammatory changes in the dental pulp which happens when there is no extension of caries into the pulp chamber [10]. The long standing Pulpal tissue infection causes secondary infection and breakdown of tissues in periodontium [11].

Such untreated endodontic infections become one of the risk factors for progression of periodontal disease [11], as these lesions sustain endodontic pathogens that may lead to additional periodontal pocket formation, increased bone loss,

calculus deposition, osteoclastic activity and subsequent bone and tooth resorption [4].

Such endodontic-periodontic lesions require both endodontic and periodontal therapies for complete healing to occur [4]. When patients present with an abscess, the periodontal and periradicular abscesses are managed differently [12]. Researchers across the globe strive to improve the different bone grafting techniques and also to provide the various means which could aid in faster and denser bony regeneration [12]. For a material to be considered a regenerative modality, a material must histologically demonstrate that bone, cementum & a functional periodontal ligament (a new attachment apparatus) can be formed on a previously diseased root surface [13].

The platelets have been used since past two decades for periodontal regeneration due to their wound healing properties [14]. They contain various growth factors which could help in increased collagen production, cell mitosis, blood vessels growth, recruitment of other cells that migrate to the site of injury and also cell differentiation induction [15].

The first use of platelets concentrate in the oral surgical procedures was in the form of platelet-rich plasma (PRP), introduced by Whitman et al (1997) [16]. He reported various advantages of using PRP in surgical procedures as it enhances the osteoprogenitor cells in the host bone and bone graft [16]. Platelet-rich Fibrin (PRF) was first introduced by Choukroun in France, for the use in the field of oral and maxillofacial surgery [17]. It is classified as a second generation platelet concentrate that is prepared as a natural concentrate without adding any anticoagulants [18].

PRF consists of an autologous leukocyte-platelet-rich fibrin matrix, composed of a tetra molecular structure with cytokines and platelets within it, which acts as a biodegradable scaffold that favors the development of microvascularization and is able to guide epithelial migration to its surface [19]. PRF is considered to serve as a vehicle in carrying cells involved in tissue regeneration and provides a sustained release of growth factors over the period of time, thus stimulating the environment for wound healing [20].

In the following case, PRF was used along with the hydroxyapatite crystals for the management of a periapical lesion. The postoperative clinical evaluation showed good healing in the surgical site with gain in clinical attachment level. Similar results were observed in the case presented by Rastogi et al [21]. Various studies across the globe have shown the clinical effects of PRF in accelerating the soft and hard tissue healing in periodontal surgeries. Thorat et al, found statistically significant results with greater bone fill and gain in clinical attachment level with the use of PRF in the treatment of infrabony defects in chronic periodontitis patients [22].

In many surgical procedures, PRF serves as a resorbable membrane for guided tissue regeneration [23]. This could prevent the migration of non-desirable cells into the bone defect, thus providing a space that allows the migration of only the osteogenic and angiogenic cells and permits the underlying blood clot to mineralize [23].

The use of bone graft along with PRF shows promising results for the regenerative procedures and as a powerful healing material in the periodontal surgeries.

## 7. Conclusion

Various in-vitro and in-vivo studies have demonstrated the safe and promising results with the use of PRF alone or in combination with other biomaterials, without any contradictory results, in the field of dentistry. Thus within the limits of this case, use of PRF in the treatment of bony defect, has shown significant pocket reduction, mobility & gain in clinical attachment levels and bone fill in a much lesser time. Considering it as a biomaterial, it can be utilized in various regenerative procedures, creating newer prospects in periodontal surgeries.

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