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Case Report

Furcation Defect Treatment with a "Periodontal Miracle Mix" of Platelet Rich Fibrin, Zoledronate Gel and Bone Graft for an Add-On Effect

M Rathana*, Rashmi Paramashiviah and Prabhuji MLV

Department of Periodontology, Krishnadevaraya College of Dental Science and Hospital, Bangalore, India

***Corresponding Author:** M Rathana, Department of Periodontology, Krishnadevaraya College of Dental Science and Hospital, Bangalore, India.

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Abstract

Introduction: The treatment of furcation defects has been a subject of extensive research, with various materials being utilized to achieve optimal regeneration. Platelet-rich fibrin (PRF) is a pool of growth-promoting factors and cytokines that have shown promising results in tissue regeneration. Zoledronate (ZLN), a third-generation Bisphosphonate (BP), is the most potent in its class, with the highest bone affinity. Both local and systemic treatments of Zoledronate have demonstrated positive outcomes in implants.

Objective: This case report aims to evaluate the effectiveness of a combination of PRF, 0.05% Zoledronate gel, and bone graft for the management of furcation defects.

Methodology: A conventional flap surgery was performed on a molar furcation defect, and the defect was treated with a combination of PRF, 0.05% ZLN gel, and bone graft. Clinical parameters, including plaque index, sulcus bleeding index, vertical probing depth, relative vertical and horizontal clinical attachment level, and gingival marginal level, were recorded at baseline and 6 months post-operatively. Radiographic assessment was conducted to evaluate the percentage of defect fill at baseline and 6 months post-surgery.

Result: The treatment resulted in a significant reduction in probing depth, gain in clinical attachment level, and improved bone fill.

Conclusion: The combination of autologous PRF, 0.05% Zoledronate gel, and bone graft demonstrated a favorable therapeutic outcome both clinically and radiographically in the management of furcation defects. This treatment approach holds promise for the effective management of furcation defects and warrants further investigation.

Keywords: *Periodontitis; Zoledronate; Platelet Rich Fibrin; Bone Graft; Furcation; Defect*

Abbreviations

PRF: Platelet rich fibrin; ZLN: Zoledronate

Introduction

Chronic periodontitis is a microbial infectious disease which results due to inflammation within the supporting tissues of the teeth and leads to progressive attachment loss, bone loss, and periodontal pocket formation and gingival recession [1]. Periodontal therapy aims to

preserve the natural dentition, periodontium, and peri-implant health, while also ensuring comfort, aesthetics, and function [2]. However, mechanical debridement alone may not always be sufficient to eliminate anaerobic infections at the base of the pocket, within the gingival tissues, and in inaccessible structures [3]. To address this issue, systemic and local drug delivery of antimicrobials has been introduced as an adjunct to scaling and root planning [4].

Despite the benefits of antimicrobial therapy, there are potential adverse effects such as drug toxicity, acquired bacterial resistance, drug interactions, and patient compliance issues that limit its use. In periodontitis, the host is primarily responsible for tissue breakdown, leading to clinical signs of disease. Therefore, various drug classes have been evaluated as host response modulators, including nonsteroidal anti-inflammatory drugs, bisphosphonates, and tetracyclines [5].

Bisphosphonates (BP), the carbon-substituted pyrophosphate analogs are potent inhibitors of bone resorption and have been effectively used to control osteolysis or reduce bone loss in Paget disease, metastatic bone disease, hypercalcemia of malignancy and osteoporosis [6].

Zoledronate (ZLN), a third generation BP, is the most potent amongst all BPs known so far with the highest bone affinities. Studies have demonstrated that local and systemic treatments with ZLN can enhance the osseointegration and fixation of orthopaedic implants as well as dental implants in rats [7]. These bone levels can be assessed through various radiographic modalities. Digital Radiography like Photostimulable phosphor (PSP) plates have been used in dentistry since the mid-1990. PSP plates have increased exposure latitude over conventional film and direct digital sensors, enabling them to accept a range of exposure without over- or underexposing the resulting radiographic image. An important advantage of this low exposure compensation is the ability to reduce patient dose. The reduction in dose is dependent upon the PSP plate system [8].

Periodontal repair and regeneration are the ultimate goal in treatment of Periodontal defects. Various biomaterials, natural as well as synthetic have been tried since many years to accelerate wound healing of both soft and hard tissue. Naturally occurring materials also known as "autologous biomaterials" are present in the body and provides signals for repair, regeneration, and healing [9]. It has been noted that the bone graft material combined with blood promotes neo-angiogenesis, new bone formation when compared to bone grafts alone. Two important autologous biomaterials, platelets and fibrin are believed to play important role in promoting the healing of wound and regeneration [10]. Platelet concentrates are a source of blood proteins enriched with growth factors to promote wound healing to introduction of fibrin glue, PRP, PRF, A-PRF, t-PRF, i-PRF, PRF lysates and CGF are some of them. Platelet concentrates used these days are very much efficient than predecessors in terms of biological efficacy and method of preparation [11].

Materials and Methods

Protocol of PRF preparations

Dr. Joseph Choukroun the research pioneer has led to the development of a second-generation platelet concentrates, in this anticoagulation factors have not been utilized. A platelet concentrate without coagulation factors can be gathered (750g) from the superficial layer of centrifugation tubes following single centrifugation cycle (2,700 rpm,12 minutes). This formulation was called Platelet rich fibrin and it contained a fibrin matrix after centrifugation. The composition of PRF include concentrate of white blood cells, platelets, and fibrin. It has been shown that the initially developed Platelet rich fibrin (also termed L-PRF) composed of 97% platelets and more than 50% leukocytes in a high-density fibrin network when compared to whole blood [12].

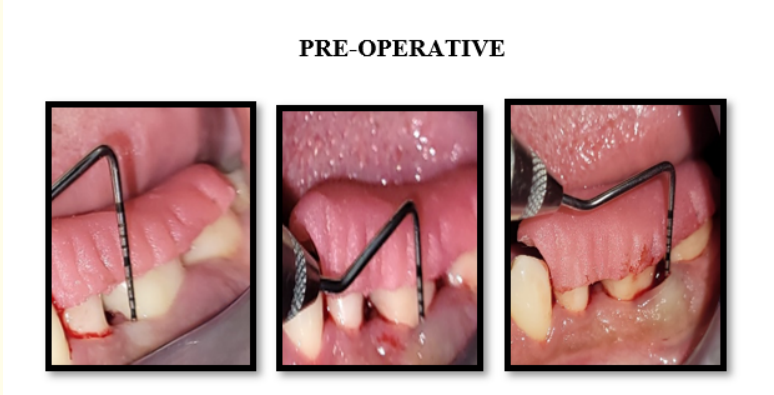
Formulation of gel

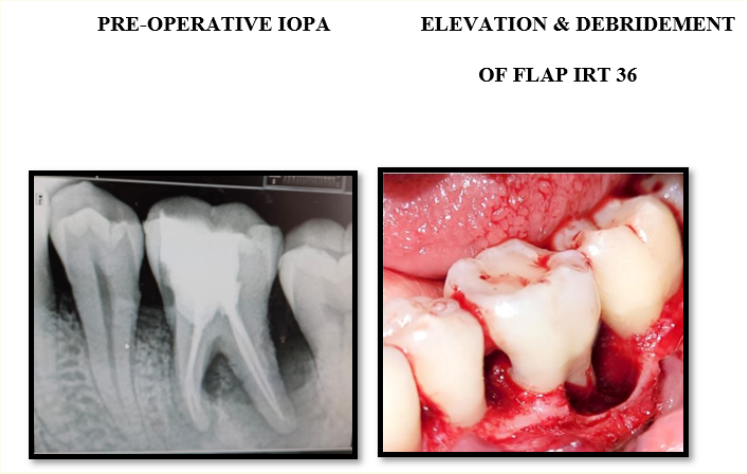
0.05% ZLN gel was prepared using commercially available drug (5 mg ZLN per 100 ml). Weighed quantity of Carbopol 934 P was added to distilled water to produce a 2% weight/weight solution. It was then allowed to soak for 2h by continually stirring the solution. Commercially available ZLN solution was added followed by 1% triethanolamine to neutralize the Carbopol solution to form a gel of pH 6.8. Finally, preservatives such as methyl paraben and propyl paraben solutions in ethanol were incorporated in the gel. The placebo gel was prepared by the above-mentioned procedure without adding active ingredient, i.e. ZLN [13].

Case Presentation

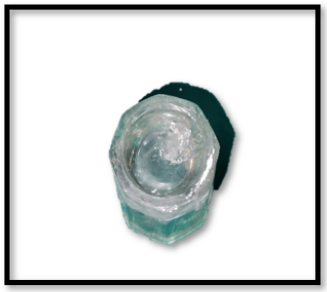
A 32-years-old male patient presented to the out-patient Department of Periodontology, Krishnadevaraya College of Dental Science and Hospital, Bangalore with a chief complaint of a painful tooth in the left lower back tooth region. Upon periodontal probing, a pocket probing depth of > 6 mm was discovered irt 35, 36, 37 region with 4 mm mesio-buccal, 11 mm mid-buccal, 8 mm disto-buccal in relation to 36 tooth region, along with grade 2 mobility observed. A pre-operative radiograph revealed radiolucency involving the inter-radicular furcation and distal root of tooth 36. Cold testing revealed no response in tooth 36.

The initial line of treatment involved scaling and root planning, and the patient was referred to the Department of Endodontics for root canal treatment for tooth 36. After the completion of root canal treatment, the patient was recalled for a follow-up appointment after three months. Tooth mobility still persisted, and intra-coronal splinting was done in the 35, 36, and 37 regions. Further surgical periodontal therapy was planned. A full-thickness mucoperiosteal flap was reflected using a periosteal elevator, and the defect was thoroughly debrided. The root surface was then planned, and the flap was trimmed to remove granulation tissue tags and minimize bleeding. After debridement, the prepared Zoledronate gel (ZLN gel), platelet-rich fibrin (PRF), and Osseo graft (xenograft) were mixed and used to fill the defect. The mucoperiosteal flap was replaced, and primary wound closure was achieved by means of 3-0 mersilk sutures. The dressing and sutures were removed after a period of 10 days.

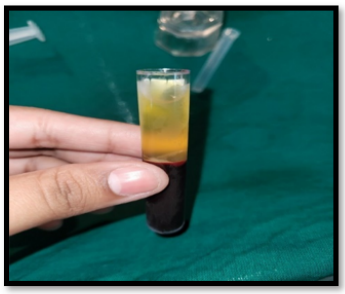




PREPARED ZLN GEL

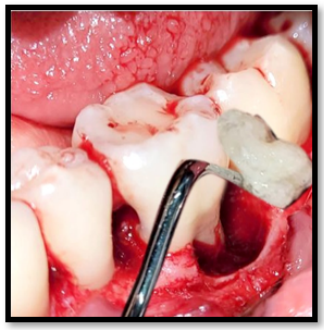


PREPARED PRF

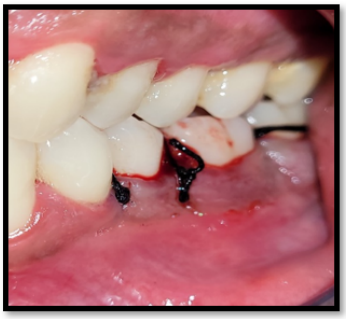


BONE GRAFT +ZLN GEL+PRF GEL

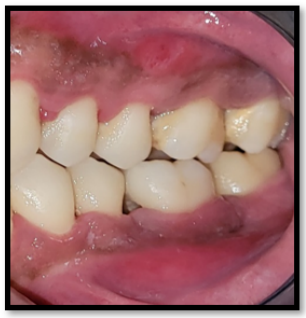
PLACEMENT OF THE MIXURE



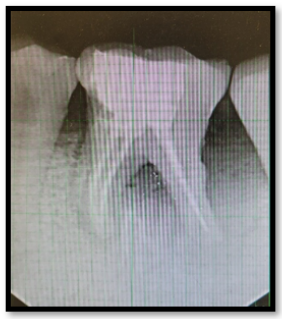
PLACEMENT OF SUTURES



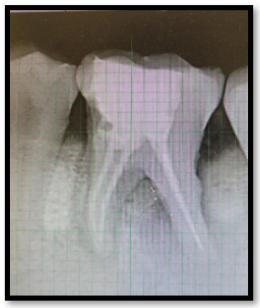
POST-OPERATIVE

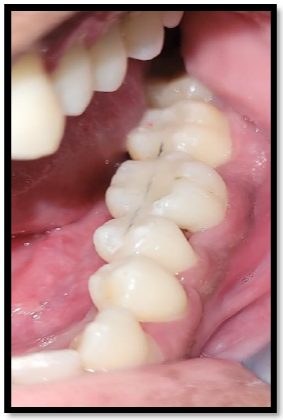


IMMEDIATE POST-OP IOPA



3 MONTHS POST-OP IOPA





INTRA-CORONAL SPLINTING DONE irt 35,36,37

Results and Discussion

In the present case the treatment of furcation defect was done using a combination of Zoledronate gel (ZLN gel), platelet rich fibrin (PRF), and bone graft irt 36 yielded satisfactory result. Six months post-operatively there was a greater reduction in periodontal probing depth (PPD), gain in clinical attachment level and more than 50% showed a bone fill radiographically. In a study by Gupta., *et al*. [7] zoledronate gel as a local drug delivery system in the treatment of chronic periodontitis where the authors have concluded that sub gingivally delivered 0.05% ZLN gel resulted not only in improvement of clinical parameters, but also in a volumetric bone gain at 6 months. Therefore, it proves to be a better non-invasive approach for the periodontal regeneration of intrabony defects in patients with chronic periodontitis. In another recent study by Rameshwari., *et al*. [14] comparing the zoledronate gel and alendronate gel as a local drug delivery agent showed that the local delivery of 0.05% zoledronate into periodontal pockets associated with intrabony defects resulted in significant reduction in PPD, CAL gain, radiological defect depth reduction at the end of 6 months. Also, zoledronate gel seems to have slight advantage over alendronate gel with respect to clinical and radiographic parameters.

Conclusion

To conclude this comprehensive treatment of combination of Zoledronate gel (ZLN gel), platelet rich fibrin (PRF), and bone graft showed a reasonably good therapeutic outcome both clinically and radiographically in the furcation defect management and warrants further investigation.

Conflict of Interest

The authors declare that they have no conflict of interest regarding the publication of this paper.

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