



Case Report

Recombinant human PDGF-BB in combination with mineralized freeze-dried bone allograft in the treatment of Grade II furcation involvement: A case report

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ABSTRACT

Recombinant human platelet-derived growth factor-BB (rhPDGF-BB) is commercially available biomaterial that can be used to regenerate the lost periodontal structure due to progression of periodontitis. The present case describes the surgical treatment of localized periodontitis with furcation Grade II involvement using platelet-derived growth factor BB (growth-factor enhanced matrix 21S) in combination with particulate allograft bone (mineralize freeze-dried bone allograft [FDBA]). This case report showed complete furcation closure after using rhPDGF-BB in combination with FDBA to treat localized periodontitis case with Grade II furcation involvement.

Keyword: Freeze-dried bone allograft, Furcation, Periodontitis, Recombinant human platelet-derived growth factor BB, Regeneration

INTRODUCTION

Periodontitis is a highly prevailing, chronic multifactorial inflammatory disease related to dysbiotic plaque biofilms and characterized by progressive destruction of the tooth-supporting structures. If left untreated, the prognosis is hopeless leading to loss of the tooth. To successfully treat periodontitis, there are three treatment phases: Phase 1: Initial/hygienic/non-surgical, Phase 2: Surgical, and Phase 3: Maintenance.^[1,2] The first phase, non-surgical phase includes oral hygiene instructions and scaling and root planing. After 4–6 weeks of non-surgical phase, the need for the second phase (surgical phase) can be determined by evaluating the case clinically. In surgical phase, there are many different surgical techniques and dental materials that can be used to treat periodontitis. One of these materials is recombinant human platelet-derived growth factor BB (rhPDGF-BB).

rhPDGF-BB is a potent wound healing growth factor and stimulator of the proliferation and recruitment of both periodontal ligament (PDL) and bone cells.^[3] rh-PDGF was the first recombinant protein to be approved by the US FDA for the treatment of chronic foot ulcers in diabetic patients.^[4] Platelet-derived growth factor (PDGF)-BB is a powerful promoter of cell proliferation and increases the expression of stem cell markers; inhibits collagen production and mineralization but accelerates the maturation of collagen chains through increased lysyl oxidase (LOX) activity and Secreted protein acidic and rich in cysteine (SPARC) expression.^[5]

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In 2005, the US FDA approved PDGF-BB (growth-factor enhanced matrix [GEM] 21S) for the treatment of intrabony periodontal defect, furcation defects, and gingival recession cases associated with periodontal defects. Periodontitis with furcation involvement represents a challenge for the clinician because of complex anatomic morphology of furcation area such as concavities of furcation roofs, narrow dimensions of furcation entrances, cervical enamel projections, and bifurcation ridges. These anatomical factors complicate diagnosis of furcation involvement and restrict access for periodontal instrumentation which will result in inappropriate or insufficient debridement.^[6] There are several types of treatment such as non-surgical periodontal treatment, open flap debridement, resective surgery, and regenerative surgery. There are several surgical regenerative techniques can be used to treat furcation involvements such as guided tissue regeneration (GTR), bone replacement grafts (autografts, allografts, xenografts, and alloplasts), biological agents such as enamel matrix derivative, PDGF, platelet-rich plasma, platelet-rich fibrin, and combinations of them.^[7] According to systematic review by Avila-Ortiz *et al.*,^[8] regenerative therapy for the treatment of maxillary buccal or interproximal and mandibular buccal or lingual Class II furcation involvement is predictable where most Class I furcation involvements may be successfully treated with non-regenerative therapy.^[8]

The present case describes the surgical treatment of localized periodontitis with Grade II furcation involvement using PDGF-BB (GEM 21S) in combination with particulate allograft bone (mineralize freeze-dried bone allograft [FDBA]).

CASE REPORT

Presentation

A 63-year-old female was referred to the Department of Periodontics, College of Dentistry, Qassim University (Buraydah, Saudi Arabia) for the evaluation of tooth #37. The patient reported having history of hypercholesterolemia and was taking Lipitor (Simvastatin 20 mg bid) as prescribed by her physician. She also reported having hypothyroidism and was taking Armour Thyroid 60 mg once daily. Dental history revealed her lower left first molar, and second premolar was extracted 5 years ago due to caries. Healing after extraction was uneventful. Periodontal examination revealed that all probing depths were <3 mm with generalized recession 1–2 mm except for tooth #37. The probing depths for tooth #37 was 4 mm on mesiobuccal site, 7 mm on mid-buccal, 5 mm on distobuccal, and 3 mm on the lingual site with bleeding on probing present in the mid-buccal site [Figure 1]. There was 2–3 mm recession on the buccal site [Figure 2]. In addition, there was Grade II buccal furcation involvement



Figure 1: Evaluation of tooth #37 – Bleeding on probing and recession evident.

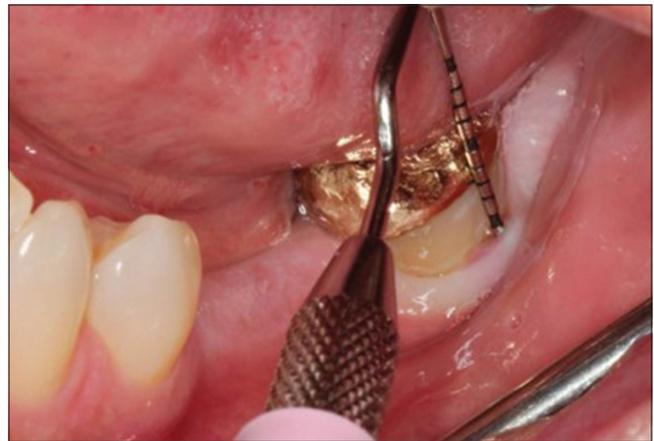


Figure 2: Evaluation of probing pocket depth using UNC-15 probe.

according to 1975 Hamp's classification. No tooth mobility was detected.

Diagnosis

From the clinical findings, according to the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions 2017,^[9] the case was diagnosed as localized periodontitis Stage III Grade A.

A periapical radiograph was taken to evaluate the tooth [Figure 3]. The radiographic examination revealed slight widening of PDL space on the mesial aspect of the mesial root and slight furcation bone loss based on the radiolucency seen. After consulting with her referring dentist, it was decided to treat the site surgically with rhPDGF-BB in combination with mineralized freeze-dried bone allograft since the patient received non-surgical periodontal treatment 2 months ago. Consultation with her physician was made for recommendations and to make sure there are no contraindications for periodontal surgery. The treatment plan was explained to the patient, and a written informed consent was acquired.

Treatment

Under sterile aseptic conditions, infiltration was done using local anesthesia with 2% lidocaine and 1:100,000 epinephrine to anesthetize the surgical area. A full-thickness sulcular incision was made on the buccal aspect of tooth #37 then crestal incision was made mesial and distal to #37. The flap was elevated to expose the affected area with no incision or reflection on the lingual side. An evident intrabony defect on the buccal aspect of tooth #37 with furcation bone loss was found [Figure 4]. Granulation tissue was removed using surgical curettes. Scaling and root planing of tooth #37 was performed using ultrasonic scaler and the site was irrigated using sterile normal saline. The distance between the furcal roof and the base of the defect was approximately 4 mm with intrabony defect. The grafting material rhPDGF-BB (GEM 21S®USA) was mixed with FDBA (OraGRAFT®, USA) [Figure 5] and this mixture was applied to site to fill the

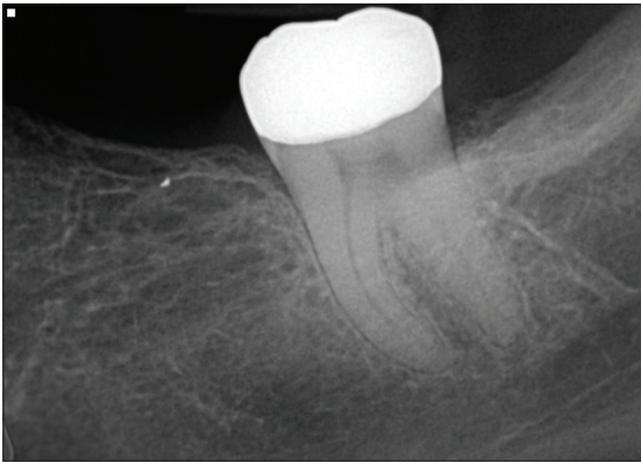


Figure 3: Radiographic evaluation of #37 showing widening of periodontal ligament space and radiolucency at the furcation site.

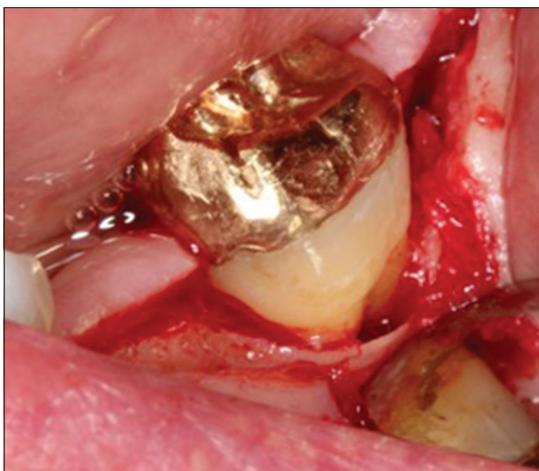


Figure 4: Surgical entry to evaluate furcation defect raising full-thickness flap.

furcation and intrabony defects [Figure 6]. Flap was sutured with 4-0 non-resorbable PTFE sutures (Cytoplast™ Sutures, Osteogenics Biomedical) [Figure 7]. Post-operative instructions were given to the patient. Post-operative medications, include 400 mg ibuprofen 3 times a day for 5 days, 875 mg amoxicillin twice daily for 1 week, and 0.12% chlorhexidine mouth wash twice a day for 2 weeks, were prescribed to the patient.

Follow-up and outcomes

Healing was uneventful. At the 2-week follow-up, the surgical site was healing well, with no signs of infection. The sutures were removed.

At the 3 months follow-up, the surgical site was completely healed. The probing depths were 2 mm for all buccal sites with no furcation involvement [Figure 8]. There was bleeding on probing



Figure 5: rhPDGF-BB (GEM 21S®USA) and FDBA (OraGRAFT®, USA). rhPDGF-BB: Recombinant human platelet-derived growth factor BB, GEM: Growth-factor enhanced matrix, FDBAP: Freeze-dried bone allograft.

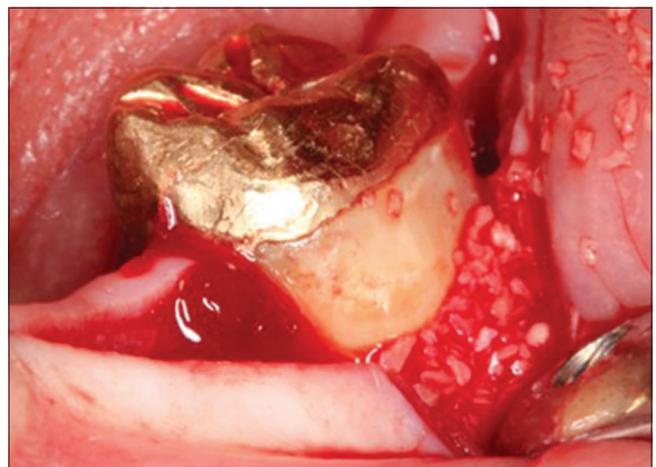


Figure 6: Grafting done using mixture of rhPDGF-BB (GEM 21S®USA) and FDBA (OraGRAFT®, USA) at Grade II furcation defect. rhPDGF-BB: Recombinant human platelet-derived growth factor BB, GEM: Growth-factor enhanced matrix, FDBAP: Freeze-dried bone allograft.

on the mesiobuccal site. Patient underwent maintenance phase (including scaling and polishing and reinforcement of oral hygiene instructions) at 3 months follow-up.

DISCUSSION

The present case report shows the outcome of periodontal surgery using rhPDGF-BB in combination of FDBA to treat localized periodontitis with Grade II furcation involvement. The probing depth reduction was significant at 3 months follow-up. It was 5 mm PD reduction on mid-buccal site which was 7 mm at pre-surgical point.

After reflection of full-thickness flap, a small piece of calculus was detected at cemento-enamel junction mid-buccally where probing depth was 7 mm which confirmed the findings of Caffesse *et al.*^[10] study where they found that the percentage of root surface without calculus after scaling and root planing decreased with increasing probing depth. They also found that the extent of residual calculus was greatest at the CEJ.^[10]

The distance between the furcal roof and the base of the defect was approximately 4 mm with intrabony defect. According to

Machtei and Schallhorn,^[11] with this clinical situation, there is better prognosis and complete furcation closure may be accepted^[11] which was accomplished in this case.

The patient was kept on 3 months maintenance phase to prevent recurrence of disease for 1-year post-surgery then as needed to maintain the gingival and periodontal health.^[12] In this case report, maintenance phase was performed for the patient at 3 months follow-up, and it was mandatory especially with BOP on mesial site which may indicate that the patient did not keep good oral hygiene.

One of the main advantages of using rhPDGF-BB to treat periodontal defect is unnecessary to place membrane over the bone graft. By avoiding using membrane, risk of membrane exposure and other relative complications associated with it can be avoided too. Machtei^[13] conducted meta-analysis to evaluate the effects of membrane exposure on the outcome of regenerative procedures in humans. Five studies with a total of 101 sites were included in this study. Out of 101 sites, 43 of these sites were exposed. They concluded that membrane exposure during healing had a major negative effect on GBR around dental implants but only a minimal effect on GTR around natural teeth.^[13]

It is documented that rhPDGF-BB is safe and effective in the treatment of periodontal defects and it increases bone formation and aids soft-tissue healing.^[14] This case report showed good outcome of using rhPDGF-BB in combination of FDBA to treat localized periodontitis Stage III Grade A with furcation involvement.

CONCLUSION

The present study showed promising results of using rhPDGF-BB in combination of FDBA to treat localized periodontitis with furcation involvement. However, more of research and clinical trials must be conducted to eliminate any confounding factors associated with it as well as to authenticate its validity.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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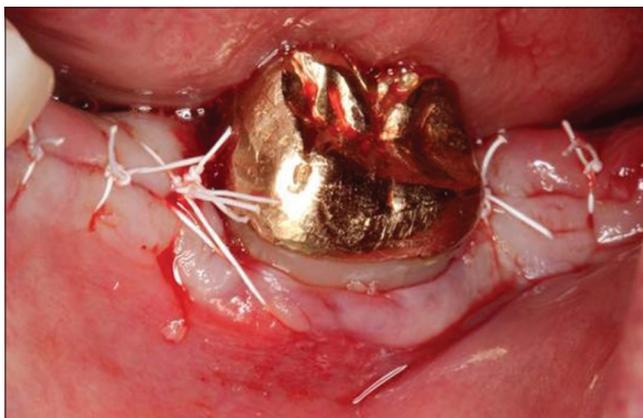


Figure 7: Closure of the flap using simple interrupted sutures.



Figure 8: Reevaluation of the tooth #37 at follow-up.

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