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Treatment of Grade III Furcation Defect using Sticky Bone along with Platelet Rich Fibrin Membrane

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Abstract

Furcation involvement in multi-rooted teeth is challenging for proper oral hygiene, clinical treatment, and leads to poor prognosis. Multiple regenerative approaches have been attempted to treat furcation defects, but complete regeneration of the periodontal apparatus in grade III furcation has not been reported. This case report introduces a treatment combining sticky bone with PRF membrane to treat mandibular grade III furcation lesions with a six-month follow-up. Case report: a 51-year-old patient presented with grade III furcation involvement of the mandibular first molar, with intrabony defects requiring guided tooth regeneration (GTR). Sticky bone wasprepared and packed into the furcation and intrabony defects. The PRF membranes were also used for space maintenance. The six-month postoperative follow-up demonstrated quicker tissue healing, significant pocket reduction, clinical attachment gain, as well as radiographic bone fill in both cases. Conclusion: Successful periodontal regeneration of grade III furcation defects can be achieved by using PRF in combination with sticky bone.

Introduction

The furcation area is characterised by an exceptional periodontal site with definite anatomic and pathogenic features, further increasing its predisposition to bacterial retention and obstructs the accessibility for oral hygiene maintenance and

periodontal debridement. [1] American Academy of Periodontology defines the furcation lesion as 'the pathologic resorption of bone in the anatomic area of a multi rooted tooth where the roots diverge'. [2]

Over the years, furcation involvement (FI) has been classified several in numerous ways, classifications have been proposed over the years based either on the severity of horizontal probing depth into the furcation defect or on the vertical amount of alveolar bone loss within the defect, or a combination of both. [3] Glickman's classification was considered as the most popular one, which divides furcation defects lesion into four grades [4], and a variety of treatment modalities for the furcation lesion, including surgical and non-surgical methods, have been recommended to enhance the prognosis, centred around the grade of furcation involvement (FI). Non-surgical periodontal therapy, which includes scaling, root planning, furcation-plasty, etc., which is aimed at the employed to treatment of the furcations with initial involvement (Grade I & early Grade II) and which restores the gingival health. Conversely On the contrary, surgical procedures that including regenerative and resective methods, are performed for the treatment resolution of more advanced lesions (Grade II & III), to which will further allow access to the internal complex areas of the furcations. [5]

Grade III furcation lesion is a through-and-through one, being one of the most complex. Teeth with a grade III FI is one of the most difficult and technique sensitive periodontal problems to treat, having a poor prognosis. The traditional resective approach, such as tunnelling, root amputation or hemi section may have a negative impact only affect the long-term prognosis of the treated tooth [6], however nevertheless, to enable self-care and maintenance of the furcation area, it is considered believed to be the as the treatment of choice for grade III and IV. In furcation lesions, aiming at facilitating maintenance of the furcation area. In recent times, numerous regenerative techniques comprising of bone grafts, GTR, growth factors, enamel matrix derivatives and bone morphogenetic proteins have been used for the regeneration of furcation defects, with results depicting varying clinical outcomes with these procedures.[2] But complete regeneration of the periodontal attachment apparatus, including bone, periodontal ligament and cementum in grade III furcation, has not been reported. [1]

For the treatment of furcation lesions in animals, the use of biologic agents like rhBMP-2 (recombinant human bone morphogenetic protein-2), rhPDGF (recombinant human platelet-derived growth factor) and TGF-β (transforming growthfactor-beta), have proven to promote osteogenesis[6-8]Additionally, for regenerative treatment in many clinical applications, the use of autologous platelet concentrates (APCs) such as, platelet-rich plasma (PRP), platelet-rich fibrin (PRF), plasma rich in growth factors (PRGF) and concentrated growth factors (CGF) is gaining popularity as a source of multiple growth factors in high concentrations. Different types of APCs are available,each with peculiar features, the most popular being platelet-rich plasma (PRP), platelet-rich fibrin (PRF), plasma rich in growth factors (PRGF) and concentrated growth factors (CGF). A recent systematic review and meta-analysis [9], evaluating the effect of use of PRF in adjunct to open flap debridement, included two clinical trials in treatment of grade II furcation with nine-month follow-up and concluded favourable results with the use of PRF in terms of clinical attachment level gain ($p = 0.07$) and bone fill ($p = 0.05$).

The concept notion of mixing combining autologous fibrin glue (AFG) with and bone graft to obtain acquire sticky bone was introduced presented by Sohn in 2010. [10] Sticky bone provides stabilization of bone graft in the defect is enhanced while using sticky bone, and therefore consequently, accelerates tissue healing is accelerated and minimizes bone loss is minimised during the healing period. As sticky bone provides properties such as easy handling and prevention of dispersion, as it has its own body and can be easily molded framed into the required desired shape., thus offers easy handling and also prevents dispersion. Also, there is a progressive effect on tissue healing when Use of PRF membrane is used as a barrier membrane over the sticky bone, as it increases escalates new de novo bone formation due to the availability presence of growth factors enriched in the surrounding. Thus leaving a positive effect on tissue healing. [11]

Thus, the present following case report describes the treatment of grade III furcation lesion involvement using with sticky bone and PRF membrane, with a 9 months follow-up period.

Case Report

Clinical presentation

A 51-year-old male patient presented with a chief complaint of persistent tooth sensitivity in the posterior lower left sextant for over 3 months. He reported stated a non-contributory relevant medical, family and social history. At the baseline examination, the patient presented depicted a fair oral hygiene, generalised pocket probing depths (PPD) ranging from 4-10mm, with faulty prosthesis in the posterior tooth region of all quadrants. Grade III FIs was found on tooth #19 and Class I mobility, with pocket depths ranging from 3 to 7 mm. Radiographic examination and clinical presentation were shown in Fig. 1.

Case Management

They opted for removal of the faulty prosthesis was removed, following which root canal treatment (RCT) was performed in relation to 36. After the root canal, treatment RCT, the was done; patient was scheduled for periodontal surgery therapy.

Prior to the surgery procedure, to prepare AFG and PRF, fresh intravenous blood was drawn from the anticubital fossa of the patient to prepare AFG and PRF and divided into two types of vacutainers. Non-coated test tubes are used to obtain AFG. Samples were immediately centrifuged at 2400-2700 rpm (approximately 400 g) for 2 min using the PRF centrifuge (Remi, Mumbai, India) to obtain two layers. The RBC's form thebottom layer and AFG forms the superficial layer, which is then extracted removed using a syringe and mixed with particulate bone powder (Sybograf Plus® - Beta Tricalciumphosphate and nanocrystal line hydroxyapatite) to form the yellow-coloured sticky bone. It takes 5-10 minutes for polymerization usually takes 5-10 min, depending on the types of bone graft used. PRF preparation requires 2 tubes of 5ml fresh intravenous blood. Samples were immediately centrifuged at 3000 rpm (approximately 400 g) for 10 min using the PRF centrifuge (Remi,Mumbai, India). The PRF clots were extracted from the tubes and were prepared as membranes.

The surgical procedure was performed under local anaesthesia and involved the elevation of a full thickness mucoperiosteal flap during the surgery, full thickness flaps were elevated with sulcular incisions, extending up to one tooth mesial and distal to of the surgical sites area under local anaesthesia. Granulation tissue was removed, thorough scaling and root planning were performed, and granulation tissue was removed. Sticky bone was then packed placed into the furcation area lesion and intabony defect, and compressed squeezed PRF membrane was used as a barrier membrane. The flap was coronally advanced by using Horizontal mattress sutures (4-0 non-resorbable silk suture from Johnson & Johnson Pvt Ltd - India) were used to coronally advance the flap and multiple single interrupted sutures used for primary closure achieved primary closure.

Post-operative care and follow up

Post-operative instructions care was explained to the patient were given verbally an and given in writing. Antibiotics and analgesics (amoxicillin and ibuprofen were prescribed). The patients were instructed to rinse with chlorhexidine for 4 weeks after surgery withno other means of plaque control, brushing or flossing at the surgical site. 2 weeks post-surgery, the sutures were removed at 2-week post-operative appointment. Brushing and flossing was resumed after 4 weeks, and the patient was advised to return to their regular periodontal maintenance routine practice. Immediate postoperative check-upwas satisfactory. For fabrication of the crown, the patient was referred to the prosthetic department.

Patient was further encouraged for the recall visit Patient was motivated for further follow-up visits and adequate sufficient self-maintenance at home. Follow ups at 1 and 3 months One month and 3 months follow-ups were satisfactory acceptable and with no grievances were reported from the patient and site of surgery showed no further disturbances. At 9 months, a follow-up radiograph was taken at 9 months, which revealed significant improvement of periodontal probing depth PPD, clinical attachment loss CAL, and FI defects; along with. Compared to the pre-surgical examination, radiographic changessuch as were observed with evident market gain of bone height, and bone regeneration in the furcation areas, were filled with

bone showing lamina dura lining the intra-radicular areas, along with resolution of the periapical radiolucency. The patient was fully satisfied and was maintaining dentition well in function. and was fully satisfied with no complaints.

Discussion

The term furcation involvement refers to the invasion of the bifurcation and trifurcation of multirooted teeth by periodontal disease is referred to as furcation involvement. It is synonymous with advanced periodontitis and due to the unique anatomical position of the furcation, influences the treatment outcome is influenced, invariably tilting the prognosis towards guarded. [12] Multidisciplinary approach in dentistry aims at preserving a compromised tooth Advances in various fields of dentistry facilitate to preserve a compromised tooth in its healthy and functional state condition. With multidisciplinary involvement. A good prognosis with well-functioning dentition can be ensuredby the However, the treatment plan is better assessed in years of healthy functioning dentition and not by mere retention of tooth. Reduction and/or elimination of etiologic and contributing factors in the periodontal disease treatment, a proper restoration, and reorientation of occlusal forces may result in good prognosis with well-functioning dentition. [13]

According to Goldman and Cohen's (1958) the classification of intra-bony pocket classification by Goldman and Cohen in 1958, the furcation defect is truly a no wall defect, with a poor for which the prognosis is poor due to lack of osteogenic cell proliferation into the area or more precisely, lack of sufficient bony walls providing the cells of the periodontal ligament which contribute most importantly to the regenerative process. [13,14] Periodontal intervention must be given priority as the periapical lesion would regress by Also, endodontic therapy, may help in regression of periapical lesion, but not the periodontal aspect. This makes periodontal intervention imperative. [13,15]

Platelets are known to release high Excessive amount of quantities of growth factors, which are stored in the granules of platelets, are released stored in their granules and released upon activation, such as platelet-derived growth factor (PDGF), TGF-β1 and TGF-β2, fibroblast growth factor (FGF), vascular endothelial growth factor (VEGF), and insulin-like growth factor (IGF), which stimulate cell proliferation, matrix remodelling, and angiogenesis.[16]

In the health sector, collection of platelet aggregates is an upcoming technique, with various advances being utilised several techniques to collect platelet aggregate have been utilized to accelerate hasten the tissue healing. in dental and medical field. Choukron's PRF is one of the recently developed platelet aggregation technique that collects leukocytes and PRF gel using a natural coagulation process, thus, freeing the risk of cross-contamination. PRF in a compressed membrane-like form has also been used as an substitute alternative for to commercially available collagen barrier membranes in guided boneregeneration (GBR) to improve tissue healing. PRF membrane consists of is constructed bya dense fibrin matrix, embedded with containing concentrated leukocytes, platelets and circulating stem cells. Enormous quantities of growth factors are generated and they generate and progressively released. Various growth factors such as TGF- β1, PDGF-BB, VEGF and thrombospondin-1 etc. These factors can promote cell migration, osteogenic differentiation, and angiogenesis to enhance wound healing and periodontal regeneration. In this study, the PRF membrane created formed a natural barrier to exclude epithelial cell down growth but without interfering soft tissue healing for 1–2 weeks. Therefore, by properly taking advantage of these properties of PRF, we could achieve better tissue regeneration and wound healing.

Sticky bone which is a biologically solidified bone graft, entrapped in fibrin, was introduced pioneered in 2010 as an alternative to titanium mesh or block bone procedure, sticky bone was introduced in 2010, which is a biologically solidified bone graft, entrapped in fibrin upon being shaken with cotton plier because particulate bone powders are strongly interconnected each other by fibrin network. Sticky bone It has numerous advantages - can be used for space maintenance, angiogenesis and tension free primary suture in GBR; sticky bone preparationwas found to be useful for alveolar ridge augmentation as bone

graft trapped within cross-linked fibrin meshwork prevented any undesirable movement of graft particles during the healing phase, which stabilized the bone graft onto the defect without the need of using any bone tacks or titanium mesh and this promoted tissue healing and also, the fibrin interconnection prevents ingrowth of soft tissue into the sticky bone graft [17]

To our knowledge, this is the first case report in an attempt to promote regeneration of mandibular grade III furcationusing sticky bone, incorporating an alloplastic graft material. In this case, at the end of 9 months, we showed significant improvement of the furcation defect, both clinically and radiographically, was seen. These changes might have been a result of true periodontal regeneration by means of new attachment, or a long junctional epithelium between the newly regenerated tissues and the root surface. These results are consistent with other clinical and radiological findings using PRFin the treatment of a mandibular grade III furcation. [1] In a recentsystematic review and meta-analysis by Castro et al. [9], the effect of use of PRF in adjunct to open flap debridement was evaluated which included two clinical trials in treatment of gradeII furcation with nine-month follow-up and concluded favorableresults with the use of PRF in terms of clinical attachment level gain ($p = 0.07$) and bone fill ($p = 0.05$).

To conclude, a compromised tooth with furcation involvement can be effectively maintained and restored to function, with proper treatment planning in a patient who is compliant. However, the success rate is also affected by an effective endodontic treatment, and good prosthetic rehabilitation which redirect the occlusal forces in a manner that is not detrimental to the tooth. The future of effective dental treatment lies therefore in a multidisciplinary approach, and we should not hesitate to make use of the same approach, when a case warrants it. Proper case selection is important for a desirable outcome of periodontal regeneration. In order to maintain the space for periodontal tissue regeneration, the clinician must consider the defect location, residual bone height, the geometrical architecture of the defect (1-wall, 2-wall, circumferential), and apply proper surgical skills.

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