Research Article

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New Trends in the Treatment of Grade II Furcation Defects by Using Second Generation Platelet Concentrates

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Abstract

The furcation defect is defined as the pathological reabsorption of interadicular bone that occurs in multi-rooted and bi-rooted teeth in advanced stages of periodontal disease, it represents a great challenge for dentists and specialists when treating them, due to their different anatomical variations such as: root trunk, furcation opening, root relationship, interdental and interadicular morphologic features, the interadicular separation and the angle of root distance, that can interfere in the response to treatment.

Some surgical strategies to cover furcation defects and exposed roots include free gingival grafts, pedicle flaps, sub epithelial connective tissue grafts, and application of different biomaterial-based grafts. We present a Case report of a 49 year-old patient who was diagnosed with grade II furcation defects on teeth 46 and 47, which were treated with Platelet- Rich Fibrin (PRF) is an autograft obtained from a blood sample of the patient undergoing processing in a centrifuge machine plus a coronal displacement flap surgical technique.

A mucoperiosteal partial superficial thickness flap was lifted up from affected teeth and PRF was obtained from a patient blood sample (10mL) in a glass tube without anticoagulant, which was immediately processed on centrifuge machine. The flap was repositioned to coronal level beyond the cement enamel line with 2 PRF membranes placed on the root surfaces and sutured. Morphometric, tomography and clinical measurement was performed 6 months after the procedure to analyze the interadicular molar zones.

The surgery showed presence of hard and soft tissues evaluated clinically and tomographically with a significant coverage of $p < 0.05$ in the fornix zones of the molars. On the interadicular area morphometric values shows that tooth 46 there was a decrease (0.0005) of -1.127 (2.104 ± 0.06 vs 0.977 ± 0.07) of defect and tooth 47 (0.0047) of -0.850 (1.891 ± 0.04) vs 1.041 ± 0.05) CONCLUSION Use of CDF together with PRF can be considered as a treatment option because it achieves a ostensibly osteoconductive, biocompatible function and reduces patient recovery time improving the prognosis of established defects.

Keywords: Furcation defects, Platelet-Rich Fibrin, PRF, Periodontal Disease, Centrifugation, Bone Regeneration.

Introduction

Periodontal disease is defined as a chronic process that generates progressive loss of the supporting tissue of teeth. It starts from an infectious immuno-inflammatory process, with the presence of acute episodes that depends of local and systemic characteristics of the host [1,2]. Destruction of alveolar bone affects anatomical areas such as furcation, this area joints root of the molars, and is important because if periodontitis leads a furcation exposed to oral environment, it can cause accumulation of bacterial plaque and destroy even more periodontal tissues, even up to cause hypersensitivity and halitosis or finally lost teeth. Traditional periodontal tissue regeneration techniques have had a good behavior over time, however the arrival of new technologies and biomaterials allows to have new trends in the clinical results of the procedures performed [3,4].

On the other hand, there is variability in techniques for treatment of grade II furcation defects, solutions have been proposed ranging from the non-surgical approach such as scaling and root planning of affected area, design of displaced flaps or resective surgeries, to use of chemical or physical agents for surface root conditioning [5-9]. The surgical techniques are carried out to improve the prognosis of the injuries and have close relation with factors such as operator`s skills, integrity of teeth to be treated, patient's oral hygiene habits, as well as access to health services and patient's systemic condition. The access flap show significant improvements in the treatment of

class II furcation defect [10].

Platelet Rich Fibrin (PRF), a second generation platelet concentrate, used among the autologous grafts as an autologous biomaterial. It is defined as a solid and elastic fibrin matrix that concentrates amounts of leukocytes and platelets prepared without the addition of external additives or anticoagulants, being an easy and inexpensive process [11]. PRF structure confers properties such as strength, flexibility and sufficient porosity to allow cell migration, besides the platelets concentrate secrete biomolecules such a cytokines, metalloproteinases and growth factors, such as platelet derived growth factor (PDGF), transformant growth factor (TGF-Beta) and vascular endothelial growth factor (VEGF), important for promoting tissue regeneration and healing processes [12-14]. Therefore PRF is considered a functional matrix for hard and soft tissues regeneration, showing favorable clinical results in the treatment of periodontal infra-osseous defects and acceleration of soft tissue healing where its role as a connective matrix attracts undifferentiated cells favoring new tissue formation from angiogenesis [15-19]. This case report proposes a treatment of grade II furcation defects with PRF produced by a centrifugal machine as a single autograft in combination with a coronal displacement flap surgical technique (CDF) and tomographic/ morphometric control 6 months later.

Case Report

This study was accepted by ethics committee of university (#15092016). A 49-year-old male patient classified as (ASA I) according to the American Society of Anesthesiology (ASA), who comes for treatment to the Department of Dentistry of the Antonio Nariño University, Colombia. Dental examination showed that extractions of left central lower lateral incisor, molars and upper right premolars had been previously performed. Radiographic and tomographic examination showed radiolucent interadicular areas of teeth, right lower first molar (46) and right lower second molar (47) compatible with furcation defect. PRF was chosen as a single autograft treatment in conjunction with a coronal displacement flap surgical technique for both furcation defects. The patient acceptance was obtained signing informed consent before the treatment, and reinforcement was made in motivation and education in oral hygiene, emphasized in brushing technique and use of dental floss [20]. An initial intraoral photographic record was made in the teeth 46 and 47 using a Canon S Power Shot SX60 HS camera and periodontal probing using North Carolina catheter and Nabers probe (PCP-UNC 156 and Nabers Colored Q-2N Hu -Friedy, Chicago, USA) and initial Cone Beam tomography was ordered in the area of lower right molars.

Treatment protocol for furcation defects consisted in a mouthwash with 0.12% chlorhexidine (20ml) for 1 minute and then local anesthesia injection. Intracrevicular incisions were made in second lower right premolar (45) to the right lower second molar (47) with a mesial and distal relaxant, respectively, up to the mucogingival line and flap was lifted. The PRF was obtained from a patient's blood sample by phlebotomy technique using two sterile 7mL red cap tubes BD 367814 Vacutainer® system which were immediately centrifuged at 3,000 rpm for 10 minutes (PLC-03 Gemmy Industrial Corp) (fig. 2) subsequently tubes were removed to allow the fibrin clot formation, which was promptly converted into two membranes through two sterile tiles, each one had 27 and 28mm of length and 10mm thickness (fig. 1B).

The flap was repositioned with two PRF membranes placed on radicular surfaces at level of furcation defect of the two teeth (fig. 1-C) and tissue was pulled towards the coronal zone beyond the cement enamel union adding non-nylon monofilament sutures. Absorbable Johnson & Johnson Ethicon® (5-0) (fig.1-D)

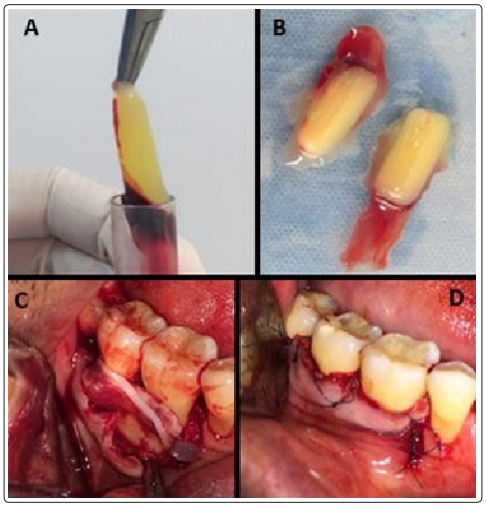

Figure 1: PRF + CDF. A) PRF Obtention B) PRF comformed membranes C) PRF in surgical site D) Suture

Figure 2: Centrifuge Machine PLC-03 Gemmy Industrial Corp

After surgery, rinses were prescribed with 0.12% chlorhexidine 15ml twice a day for 7 days, 1 hour after consuming food, additionally patient was prescribed oral Acetaminophen tablets 500mg three times per day for three days. Clinical assessment, photographic records and cone beam computed tomography (CBCT) was realized previous and six month after surgery (fig.3) It was evaluate the probing depth (PD), clinical attachment level (CAL), horizontal furcation (HF) and gingival recession (GR). The furcation area was measured with images of CBT in the Image G® software. Five measurements were performed in each tooth for an only observer, mean and standard deviation was obtained.

The CBCT six months later show radiopacity compatible with new bone formation. In 46 there was a significant decrease of 1.127mm (2.104 ± 0.06 compared to 0.977 ± 0.07) in the interradicular defect. On tooth 47 also decreased 0.850mm (1.891 ± 0.04 compared to 1.041 ± 0.05) (Fig. 2). Likewise, a significant difference was registered in the decrease in furcation entrance length horizontally

in (0.0062) of -0.515 mm (3.566 ± 0.06 compared to 3.051 ± 0.07) and on tooth 47 (0.0124) of -0.333 mm (3.754 ± 0.06 compared to 3.421 ± 0.02) (Fig. 3) The clinical changes favored root coverage initially, the gingival margin measurements changed, the bleeding on probing disappeared and clinical attachment level also. During the period of time evaluated it could be established that soft tissue gain in the interradicular area was clinically visible and the horizontal defect in both teeth had disappeared.

Discussion

This case evaluated clinical behavior of autologous product developed by a centrifuged machine. PRF matrix and CDF in the treatment of furcation defects with a good response. Here used the CBCT as an accurate diagnosis tool that optimize the treatment decisions and assess the healing process in quantifiable way [21]. The PD, CAL, HF and GR were show positive results in the treatment. Lost bone structure was covered in the furcation area by 44.9% and 53.5% in teeth 46 and 47, respectively. This indicates that stability tissue has been favorable up to evaluated period (6 months) (Table 1).

Inclusion of new biotechnologies like alloplastic grafts, bone biomaterials, resorbable and non-resorbable membranes, platelet concentrates, and displaced flaps are some options that depends factors such as the operator's ability, patient care, costs, it can generate a recovery almost total of tissues affected. Bajaj et al. 2013 proposed treatment of furcation grade II defects in 37 patients performing an open flap debridement (OFD) with help of PRF and PRP. All the clinical and radiographic parameters showed improvement in both test sites (PRF with OFD and PRP with OFD) in comparison with those where OFD acted as control. Relative vertical clinical attachment level gain was greater in PRF sites (2.87 +/- 0.85 mm) and PRP (2.71 +/- 1.04 mm) compared to control sites (1.37 +/- 0.58 mm), and gain horizontal clinic was statistically significantly greater in both PRF and PRP than control group [22].

In another report effect of PRF membranes (group A) compared with resorbable collagen membranes (group B) in 22 patients who had grade II furcation defects showed a similar behavior according to a study by Asimuddin et al. 2017. However, level of vertical relative clinical attachment (VRCAL) and horizontal (HRCAL) had statistically significant differences (p = 0.04) and (p = 0.006) respectively in group A after 9 months of treatment [23]. Similarly, the present study show a reduction of the bone defect with use of PRF.

Biswas et al. 2016 used two groups, patients with grade II furcation defects were treated with (NovaBone) bone xenograft material and others with PRF membranes. There was a general reduction in the PS and GR measurements, however, PRF membrane + NovaBone® showed better results in reduction of vertical and horizontal probing depth at the end of the third month (p = 0.0004), sixth month (p = 0.00001) and ninth month (p = 0.0004) [24].

In a study by Rahman Siddiqui et al 2017 compared PRF and beta-tricalcium phosphate in treatment of grade II furcation lesions, group I was treated with PRF, group II with beta-tricalcium phosphate and in group III only with surgical technique, clinical criteria were evaluated as probing depth, level of vertical clinical attachment, horizontal clinical attachment level, gingival recession, relative height, horizontal depth and vertical height of furcation. A reduction in depth was obtained as a result of probing and a gain in the horizontal and vertical clinical attachment level were greater in group II than I, was found in relative vertical and horizontal height of furcation was better in the group I compared to group II [25].

In conclusion, the PRF and CDF can be considered as a low-cost therapeutic alternative in treatment of grade II furcation lesions and can be used alone or combined with another biomaterial or surgical technics, showing results that improvement prognosis of this lesions, tisular changes can be possible because biomolecules contained in PRF that actives genes implied in formation of new bone, such as BMPs, PDGF, TGFβ and others [26].

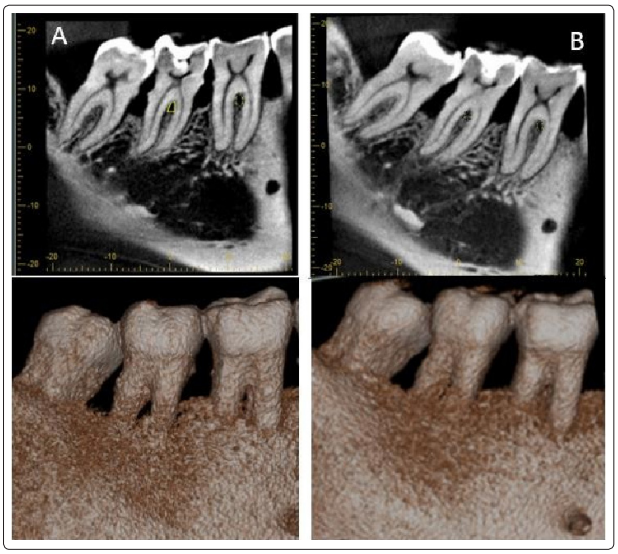

Figure 3: A) Initial CBCT of Interradicular areas of first and second molars. B) CBCT after six months of PRF treatment

Table 1: Clinical parameters at the initial and six months after treatment

Variable (mm)	Tooth 46							Tooth 47						
	Initial			6 months			Dif	Initial			6 months			Dif
	M	C	D	M	C	D		M	C	D	M	C	D	
PD	2	3	2	1	2	1	1+/-1	3	3	3	3	2	2	1+/-1
GR	-2	-3	-4	-2	-2	-4	1+/-2	-2	-3	-3	-2	-2	-2	1+/-1
CAL	4	6	6	3	4	5	1+/-2	5	6	6	5	4	4	2+/-1
HF	5			2			3+/-1	5			3			2+/-1

(mm) millimeters; (M) Mesial; (C) Medial; (D) Distal ; (Dif) Difference- mean and standard deviation

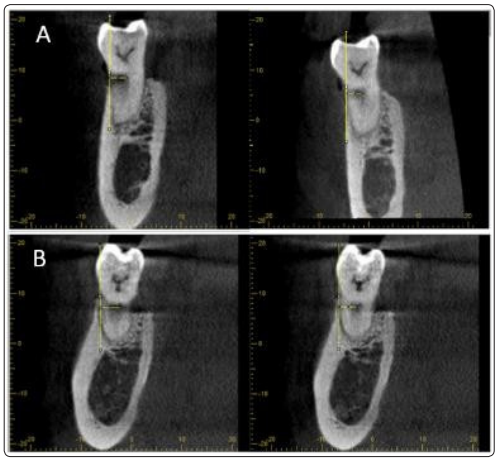

Figure 3: Tomography of interradicular zones (A-B) Entrance to horizontal furcation tooth 46 initial tomography and at 6 months after surgery (C-D) Entrance to the furcation horizontal tooth 47 initial tomography and after six months.

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