

Comparing the Efficacy between Titanium Platelet Rich Fibrin (T-PRF) and Open Flap Debridement (OFD) in Periodontal Intrabony Defects - A Split Mouth Study

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ABSTRACT

The aim of this case series was to compare the efficacy of Open Flap Debridement alone (OFD) with Titanium Platelet Rich Fibrin (T-PRF) in intrabony defects.

Keywords: OFD; T-PRF; Intraosseous defects

Introduction

Chronic periodontitis is an infectious disease causing destruction of soft and hard tissue ultimately causing tooth loss. Access flap surgery alone is a recognized standard to manage residual pockets after cause related therapy [1]. However, conventional open flap debridement (OFD) falls short of the regenerating tissues. Titanium-prepared platelet-rich fibrin (T-PRF), 3rd generation of PRF, in which the method of preparation is based on the hypothesis that titanium tubes may be more effective at activating platelets than the glass tubes used in Choukroun's method. This material is used to avoid any adverse effects in the short or long term, or both, of dry glass or glass-coated plastic tubes and to eliminate any speculations about silica [2].

Case Series

This was a case series conducted in 3 subjects visiting Renupriya Dental Clinic, BTM, Bangalore. A total of 6 chronic periodontitis sites were selected. In each subject a minimum number of two sextants were present with pocket depth ≥ 5 mm in at least threeteeth. Both verbal and written consent was obtained.

The entire study was completed within a span of 9 months including the follow up. Groups were divided as-

Group I: Three intra bony defects will be treated using open flap debridement alone (OFD)

Group II: Three intra bony defects will be treated by using open flap debridement (OFD) with placement of T-PRF prepared in titanium tubes.

Inclusion Criteria: Age group 30- 55 years, Minimum 20 permanent teeth should be present, Periodontal pocket depth ≥ 5 mm after scaling and root planning, Narrow and deep intra bony defect.

Exclusion Criteria: Systemically compromised patients and those on medications (corticosteroids/ Bisphosphonate, statin therapy) that may interfere with wound healing. Grade II, Grade III tooth mobility, Grade III furcations. Tobacco and alcohol users, Pregnant and lactating women, Subjects who undergone periodontal treatment within a period of past 1 year.

➤ Clinical Parameters to Be Assessed:

➤ Plaque index(Silness&Loe 1964) [3]

➤ Modified sulcus bleeding index(Mombelli& Van Osten MAC 1987) [4]

➤ Gingival Index(Loe&Silness 1963) [5]

➤ Pocket Probing Depth and Periodontal Attachment Level(PAL) [6] using manual UNC-15 probe

Following initial examination a full mouth scaling and root planing procedure was performed. Re-evaluation will be done after 1 week and if the tissue response is satisfactory. The patients will be scheduled for surgery after 4 weeks.

Procedure

Comprehensive medical and dental history was recorded and advice blood investigations which included total count, differential count, haemoglobin percent, bleeding time, clotting time and random blood sugar. Scaling and root planning was performed and oral hygiene instructions were given. Maxillary and mandibular alginate impressions were made and acrylic stents were customized for reproducibility of clinical parameters. Stents were grooved in occlusion apical direction with a tapered bur so that UNC-15 periodontal probe with rubber stopper can be returned to the same position for each successive measurement. Radiographic assessment was carried out using radiovisiography (R.V.G) and orthopantomogram (O.P.G). Periodontal evaluation was performed 4 weeks after phase I therapy to confirm the stability of sites for periodontal surgery. Persistence of ≥ 5 mm probing depth with radiographic evidence of bone loss were randomly assigned to either of the groups.

On the day of surgery, the customized acrylic stent was used to record the pocket probing depth using manual UNC-15 probe. Profound local anesthesia i.e 2% Lignocaine with 1: 2,00,000 Adrenaline was delivered to the area of surgery. After administration of

local anesthesia, intramuscular incisions were placed and then using aperiosteal elevator a full thickness buccal and palatal/lingual flaps were elevated. Granulation tissue was removed using gracey curettes (hu-friedy) to provide full access and visibility to the root surfaces.

Preparation for T PRF

- 9 ml blood was withdrawn from the patient and centrifuged at 2,800 rpm for 12 mins with centrifuge (Remi R4C) to obtain Titanium platelet rich fibrin layer between a base of red blood cells at the bottom and acellular plasma on the surface. Pre suturing of the mucoperiosteal flap was done followed by placement of T-PRF. Final repositioning and suturing of the mucoperiosteal flap was done with 3/0 silk using simple interrupted suturing technique. Periodontal dressing (coe-pak) was used to cover the treated sites (Figure 1).



Figure 1: Preparation for T PRF

Statistical Analysis

Statistical package for social sciences (SPSS) for windows version 22.0 released in 2013 was used to perform statistical analysis. Descriptive analysis of all the outcome parameters was done using mean and standard deviation. One way ANOVA test followed by Turkey's had posthoc analysis was used to compare the mean values of clinical parameters between two groups at different time intervals. Repeated measures of ANOVA followed by Bone ferronis post hoc analysis was used to compare the mean values of various clinical parameters between different time intervals in each study group.

Results

A case series of 3 patients was conducted. Group I consisted of 3 IBD, which were treated by OFD alone and group II consisted of 3 IBD, treated with OFD and autologous T-PRF. These patients were matched for baseline parameters of plaque index, PPD, CAL, and IBD depth.

The comparative analysis of plaque index values showed a statistical significant decrease in both the groups after 9 months of surgery from baseline, but with no statistically-significant differences between both the groups. The comparative analysis of all the groups with respect to PPD and CAL showed that there were significant differences in values between groups I and II. The defect depth reduction (DDR) was calculated for the two groups at 9 months using the following formula:

$$\text{Bone fill percentage} = \frac{\text{Baseline DD} - 9\text{- months DD}}{\text{Baseline DD}} * 100$$

where DD was the linear radiographic depth (in mm) of the defect.

The comparative evaluation between two groups with respect to DDR showed a statistical significant difference in bone fill percentage between groups I and II.

Defect Fill

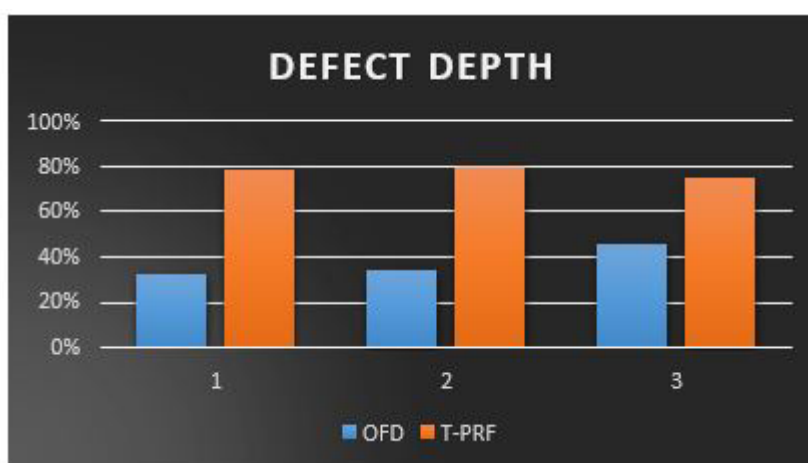


Figure 2: Defect Fill

This graph overall demonstrates about the defect fill in both the groups. Group I (OFD) showed 44.5% mean defect fill and group II (T-PRF) had 74.8% (where 1, 2 and 3 represents the sample size). Therefore this graph illustrates that the groups showed statistical significant improvement from baseline but highest mean defect fill was seen in group II followed by group I (Figure 2).

Discussion

This study was conducted to compare the efficacy of Open flap debridement (OFD) alone and OFD with autologous Titanium Platelet Rich Fibrin (T-PRF) for treating the intraosseous defects in chronic periodontitis. The results of the present study have demonstrated that using T PRF along with open flap debridement in treating intraosseous defects has improved the clinical and radiographic outcomes.

Nickles & Karing (1995) [7] stated that, conventional Open Flap Debridement (OFD) falls short of regenerative tissues destroyed by the disease and current regenerative procedures offer a limited potential towards attaining a complete periodontal restoration. Also systematic reviews by Trombello (1995) [8] & Heitz-Mayfield (2006) [9] showed at least 18 distinctly different treatments which were tested in 26 randomized controlled trials. They concluded that the use of specific biomaterials or biological agents was more effective

than OFD in improving the plaque index, gingival index, attachment levels, pocket probing depth and defect fill in intraosseous defects.

The TPRF samples have demonstrated a highly organized and thicker fibrin network with continuous integrity as compared to PRF in healthy participants. The hypertensive and smokers showed less prominent fibrin border between the cellular structures in both the platelet concentrates, but sufficient fibrin mesh network was found in T PRF clot as compared to PRF clot in the test participants (2017) [10]. The 3rd generation concentrate by Tunali in (2013) [11] conducted a study on T-PRF on a rabbit model showed the induction of bone and new connective tissue attachment within the next 30 days when T-PRF was used. A histomorphometric analysis showed that the T-PRF fibrin network covers a larger area than the leucocyte and platelet rich fibrin network, and further the fibrin seemed thicker in the T- PRF samples. Thus, platelet activation by titanium seems to offer some higher characteristic strength to T-PRF. Studies have also shown the increased duration of the release of growth factors with T-PRF as compared to PRF, again attributing to the thicker fibrin meshwork. Titanium has one of the highest strength to weight ratios and corrosion resistance among metals. Due to its noncorrosive properties, titanium has excellent biocompatibility. The material passives itself in vivo by forming an adhesive oxide layer. Titanium tubes (grade IV) also displays a unique property of osseo integration, connecting both structurally and functionally with the underlying bone.

Chatterjee et al (2017) [12] did a study on intrabony defects using PRF and T PRF, the sites wererandomly divided into group 1 OFD, group 2 OFD with PRF and group 3 OFD with T PRF. Finally at the end of 9th month the clinical parameters and defect fill percentage of groups 2 and 3 showed statistically improved results compared to group 1 but no statistical difference between group 2 and 3.

The subjects recruited in the present study had varied oral hygiene status, which was brought down to minimal plaque index scores following SRP, and baseline values were maintained for all three groups after surgery at 3, 6, and 9 months. The success of periodontal therapy is based on a regular program of recall maintenance and oral hygiene instructions. Periodontal surgical therapy, in the absence of an appropriate supportive periodontal therapy, will fail eventually.

To the best of our knowledge there has been only one study by Chatterjee et al (2017) [12] reporting the use of T-PRF with OFD in intraosseous defects and our study is in accordance with the similarity in the design of the study conducted by were the bone fill percentage.

Conclusion

The present study was designed to evaluate and compare the clinical and radiographic outcomes of group I (open flap debridement alone), group II (open flap debridement with T PRF) in treating periodontal intraosseous defects. Therefore, the present study demonstrated that in treatment of intrabony defects, using regenerative material i.e OFD with T PRF shows better results compared to Open Flap Debridement alone. However more long term studies are yet to be performed.

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