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To evaluate platelet rich fibrin combined with hydroxyapatite bone graft versus amnion chorion membrane in the treatment of intrabony defects in chronic periodontitis

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Aim: The purpose of the present study was to evaluate the efficacy of Platelet rich fibrin combined with hydroxyapatite bone graft in one site and amnion chorion membrane in the other site both clinically and radiographically in the treatment of intrabony defects in chronic periodontitis.

Method: 15 patients with 30 sites which were segregated into Site I and Site 2, with Platelet rich fibrin combined with hydroxyapatite and amnion chorion membrane in the treatment of site 1 and site 2 respectively. The clinical parameters recorded were Plaque Index, Probing depth, and Relative attachment level at baseline, and 6 months post-operatively. Radiological evaluation of bone defect depth was done at baseline and 6 months post-operatively.

Results: Both the experimental groups showed statistical significant reduction of plaque index, sulcus bleeding index, probing depth, gain of clinical attachment level, relative attachment level and bone level, with no statistically significant difference between the two sites. There is statistically significant bone gain in both sites 2.64±0.27 at site 1 and 2.67±0.48 at site 2 (p=0.01).

Conclusion: Both the groups showed significant gain in clinical and radiographical parameters. Amnion chorion membrane is effective in the treatment of intrabony defects and has bone regenerative potential and further evaluation has to be done.

Keywords: Platelet Rich Fibrin, Hydroxyapatite, Amnion Chorion Membrane, Intrabony Defects, Chronic Periodontitis

Introduction

Periodontitis is an inflammatory disease of supporting tissues of teeth that leads to progressive deterioration of the periodontal ligament and alveolar bone with

periodontal pocket formation, gingival recession or both.[1] Open flap debridement with or without bone substitutes and guided tissue regeneration are all options for regenerative periodontal therapy.[2]

Hydroxyapatite is a bio ceramic material which is biocompatible, non-toxic, slowly resorbing, osteoconductive, osteophytic material with a predictable outcome when combined with PRF.[3] PRF is a biocompatible product that contain cytokines, platelets, leukocytes, and fibrin, can be used as a slow-release delivery strategy, which gave a wide range of applications in tissue regeneration.[4]

Amnion chorion membrane (ACM), which is derived from the placenta has inherent angiogenic and enhanced wound healing properties, as well as biologic features such as regulators for healing and inflammation and anti-inflammatory properties, is one of the membranes for guided tissue regeneration.[5]

Till date, the efficacy of ACM and PRF combined with hydroxyapatite bone graft has not been compared. Hence, the current study was designed to assess the clinical and radiographic efficacy of PRF combined with hydroxyapatite and ACM in the treatment of intrabony defects.

Materials and Methods

A double-blinded, randomized, split-mouth, clinical study was conducted with a sample of 15 patients with 30 sites which were segregated into Site 1 and Site 2. Platelet rich fibrin combined with hydroxyapatite bone graft was used in the treatment of site 1 and site 2 was treated with amnion chorion membrane.

Inclusion criteria

- Patients with age group 30-50 years.
- Patients with chronic periodontitis having similar interproximal, intrabony defects in posterior sextant.
- Intrabony osseous defects defect with ≥2mm (on an intraoral periapical radiograph, the distance between the alveolar crest and the base of the defect).
- Interproximal probing depth should be >5mm after initial periodontal therapy.
- Systemically healthy patients.
- The plaque and gingival index following initial periodontal therapy have to be <1.

Exclusion criteria

- Non-vital teeth.
- Patients with aggressive periodontitis.
- Patients with one wall defects and interdental craters.
- Teeth presenting with furcation involvement.
- Pregnant and lactating patients.
- Patients with insufficient platelet counts.
- Patients who use tobacco in any form.
- Patients who have immunosuppressive diseases, coagulation defects, anti-coagulant therapy, infectious diseases, undergoing steroid therapy.
- Patients who had undergone periodontal therapy in the last six months.

After a detailed case history and clinical examination, two sites from each patient were considered. The plaque index (PI), probing pocket depth (PD), relative attachment level (RAL), and intrabony osseous defect >2mm (as determined on an intraoral periapical radiograph GRID) were all documented, after scaling and root planning, as well as post-surgically at 6 months.

Surgical procedure

Intraoral antisepsis was performed with 0.12% chlorhexidine digluconate rinse after completion of extraoral antisepsis with povidine iodine solution. The surgery was performed under local anaesthesia (2% lidocaine), crevicular and interdental incisions were given and a full thickness flap was elevated. After

completion of debridement the surgical site was irrigated copiously with 0.9% normal saline. Site 1 was treated by placement of PRF with hydroxyapatite bone graft and covered with PRF membrane as shown in Fig 1& 2 and Site 2 was treated with amnion chorion membrane alone as a graft material and to cover the defect, as shown in Fig 3 & 4. Interrupted direct loop sutures were used to seal the interdental space and a non-eugenol dressing was used to protect the area. Systemic antibiotics along with analgesics were provided for all patients, and a 0.2 % chlorhexidine digluconate rinse (for 30 secs after tooth brushing twice daily for a week).

2 weeks post-surgically, the periodontal dressing and sutures were removed. Surgical wounds were gently cleansed with 0.2% chlorhexidine applied on a cotton swab. Gentle brushing was advised to the patient. After 8 weeks, each patient was reminded of the need of appropriate oral hygiene.

Figure 1 & 2: Placement of PRF with hydroxyapatite in the defect site and PRF as a barrier membrane over the defect

Figure 3 & 4: Placement of ACM in the defect site and as a barrier membrane over the defect

Statistical analysis

All the clinical, radiological parameters were subjected to the following statistical analysis using SPSS software v.23.0. Friedman test was used for intra group comparison of the mean differences of clinical and radiographic parameters. Wilcoxon sign rank test is used to compare the clinical parameters at site1 and site 2 Independent t test was used for comparison of BD at Site 1 and Site 2 from baseline to 6 months.

Results

Both the sites showed significant improvement in all the clinical parameters and radiographic defect depth as shown in Table No 1. On inter group comparison of site 1 to site 2 at baseline (p=0.43), and 6 months there was no statistically significant difference (p=0.83), probing depth values at baseline (p=0.79), and 6 months (p=0.16) there was no statistically significant difference. On comparing the relative attachment level between both the sites there was no statistically significant difference at baseline (p=0.24), and 6 months (p=0.35). On comparison of site 1 to site 2, at baseline (p=0.24) and 6 months (p=0.35) there was no statistically significant difference as shown in Table No 2.

Fig 5 & 6: Pre-operative and post-operative probing depth of Site 1

Fig 7 & 8: Pre-operative and post-operative probing depth of Site 1

Table 1: Intragroup comparison of Plaque Index, Probing Depth, Relative attachment level and Bone defect depth at baseline and 6 months.

Clinical parameters	Groups	Observation Period	Mean±SD	P value
Plaque Index	Site I	Baseline	1.40±0.27	0.000
		6 months	0.44±0.15	
	Site II	Baseline	1.48±0.32	0.000
		6 months	0.44±0.12	
Probing depth	Site I	Baseline	7.37±0.63	0.000
		6 months	3.20±0.41	
	Site II	Baseline	7.46±0.91	0.000
		6 months	2.86±0.35	
Relative attachment level	Site I	Baseline	10.80±1.37	0.000
		6 months	6.40±1.18	
	Site II	Baseline	11.33±1.54	0.000
		6 months	6.73±1.09	
Bone defect depth	Site I	Baseline	4.00±0.75	0.000
		6 months	1.36±0.48	
	Site II	Baseline	4.13±0.99	0.000
		6 months	1.46±0.51	

Table 2: Intergroup comparison of Plaque Index, Probing Depth, Relative attachment level and Bone defect depth at baseline and 6 months

Clinical parameters	Groups	Site 1 Mean±SD	Site 2 Mean±SD	P value
Plaque Index	Baseline	1.40±0.27	1.48±0.32	0.43
	6 months	0.44±0.15	0.44±0.12	0.83
Probing depth	Baseline	7.37±0.63	3.20±0.41	0.79
	6 months	7.46±0.91	2.86±0.35	0.16
Relative attachment level	Baseline	10.80±1.37	6.40±1.18	0.24
	6 months	6.40±1.18	6.73±1.09	0.35
Bone defect depth	Baseline	4.00±0.75	4.13±0.99	0.24
	6 months	6.40±1.18	1.46±0.51	0.35

Discussion

Regeneration of tissue, damaged by inflammatory periodontal disease, has long been the choice of periodontal therapy. There are various treatment modalities available for regeneration of periodontal tissues which include bone grafts, membranes, use of growth factors, tissue engineering, guided tissue regeneration, or a combination of one or more of the

above procedures. PRF in combination with hydroxyapatite has a synergistic effect and has been proved to have better regenerative potential compared to the usage of PRF alone. On the other hand, ACM is a placental membrane, long been used as a scaffold in regenerative procedures.

Care was taken to include intrabony defects with three walled or combined wall defects, as they provide the best spatial relationship for defect bridging by vascular and cellular elements from PDL and adjacent osseous walls. Also, the presence of more number of defect walls provide space maintenance, protection and retention of grafts

An invitro study by reported that growth factors and other substrates produced by amnion chorion membrane were capable of osteogenic differentiation, presenting a potential for bone regeneration. [6] So in the present study, ACM was used a graft material for bone regeneration in the treatment of intrabony defects in chronic periodontitis.

In the present study, the clinical parameters recorded were plaque index, probing pocket depth, relative attachment level, and intrabony osseous defect >2mm. Both the sites showed significant improvement in plaque index, probing depth and relative attachment level from baseline to 6 months.

Periodontal pocket is considered as the pathognomonic sign of periodontal disease and reduction in Pocket Depth (PD) is one of the determinants for successful periodontal therapy. PD reduction in the present study was significant from baseline to 6 months (3.20±0.41 mm, 2.86±0.35 mm) in both Site 1 and Site 2, whereas there was no statistically significant difference on intergroup comparison. The significant reduction in PD in both of the groups may be attributed to the release of growth factors like fibroblast growth factor; and transforming growth factor-b released by both PRF and ACM. The significant PD reduction at Site 1, was 4.17±0.22 mm which was in accordance with the results of previous studies, [7,8] All the surgical procedures materials resulted greater reduction in PD. The significant reduction in PD in both of the groups may be attributed to the release of growth factors like fibroblast growth factor; and transforming growth factor-b released by both PRF and ACM. The gain in RAL at site 1 was similar to the previous study[9] where a significant RAL gain was obtained from baseline to 9 months. Higher concentrations of Laminin 5 in ACM, may have been the cause of gain in CAL and RAL at site 2.[10]

Bone gain of 57.05% was observed in site 1 and a bone gain of 54.4% was observed in site 2. On inter-group comparison of site 1 and site 2, there was no statistically significant difference. Previous study reported significant bone fill from baseline to 6 months when PRF along with hydroxyapatite was used.[7]

ACM was capable of providing growth factors and other substrates for osteogenic differentiation, which increased the efficacy of osteogenesis in MG-63 cells (have osteoblastic activity). This osteogenic potential of ACM makes it an effective material in bone regeneration. [6] When utilised as strips and blended with bone graft material, ACM exhibited remarkable success in the treatment of intrabony defects in peri-implantitis.[11]

Conclusion

In the light of our results, both PRF combined with hydroxyapatite and ACM resulted in considerable probing depth decrease, clinical attachment level gain, and significant bone fill, demonstrating similar effect of both platelet rich fibrin combined with hydroxyapatite

and ACM. In order to evaluate ACM in perspective of its limitations, more research needs to be done.

Overall, it can be concluded that ACM is equally efficient as a bone graft material as PRF combined with hydroxyapatite bone graft in the management of periodontal intrabony defect.

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