

**How to Cite:**

Bhardwaj, A., Ahlawat, M., Chopra, M., Joon, A., Asmin, P. K., & Godara, M. (2022). Clinical comparison of efficacy of Alloplast (Biograft HT) and PRF (Platelet Rich Fibrin) in the treatment of intrabony defects. *International Journal of Health Sciences*, 6(S6), 446–453. <https://doi.org/10.53730/ijhs.v6nS6.10094>

## **Clinical comparison of efficacy of Alloplast (Biograft HT) and PRF (Platelet Rich Fibrin) in the treatment of intrabony defects**

**Anuva Bhardwaj**

Senior Lecturer, Department of Pedodontics, Rayat Bahra Dental College and Hospital, Mohali, Punjab, India

\*Corresponding author email: [bhardwajanuva1@gmail.com](mailto:bhardwajanuva1@gmail.com)

**Monika Ahlawat**

Senior Lecturer, Department of Conservative Dentistry and Endodontics, Faculty of Dental Sciences, P.D.M University, Bahadurgarh, Haryana, India

**Meenakshi Chopra**

Associate Professor, Department of Public Health Dentistry SGT Dental College, Hospital and Research Institute, Gurugram, Haryana, India

**Akanksha Joon**

Senior Lecturer, Department of Conservative Dentistry and Endodontics, Faculty of Dental Sciences, SGT University, Gurugram, Haryana, India

**Asmin P. K.**

Assistant Professor, Department of Public Health Dentistry, Coorg Institute of Dental Sciences, Virajpet, Karnataka, India

**Meenu Godara**

PG Student, Department of Conservative Dentistry and Endodontics, Faculty of Dental Sciences, P.D.M University, Bahadurgarh, Haryana, India

**Abstract**---*Introduction:* Clinical and Radiographic comparison of the efficacy of an alloplast (Biograft-HT®\*) and Platelet rich fibrin (PRF) in the treatment of intrabony defects. *Materials and Methods:* A total number of 88 sites in 32 subjects were selected for the study and divided in two groups on basis of material use for treatment i.e platelet rich fibrin (PRF) and biograft-HT®. *Results:* The statistical analysis was done using SPSS (Statistical Package for Social Sciences) Version 15.0 statistical Analysis Software. At baseline there was no statistically significant difference between the groups. *Conclusion:* The comparison of PPD and CAL measurements between the two groups at different time intervals revealed no statistically significant difference.

The defect fill and the percentage defect fill from 3 to 6 months was statistically significant in two groups.

**Keywords**---Bone, Depth, Graft, Pocket.

## **Introduction**

Bone grafting is one of the most common modality to restore the bony defects. Among the numerous filling materials, autogenous bone seems to be the gold standard, but its use is limited by the difficulty of obtaining large amounts of donor tissue.<sup>1</sup> So, many attempts have been made to find a synthetic graft material that matches the features of autogenous bone.<sup>2</sup> Hydroxyapatite and tricalcium phosphate are the most widely used calcium phosphate biomaterials. These biomaterials display bone growth “guiding” properties, causing bone to grow into areas which the bone would otherwise not occupy. Hydroxyapatite tends to favor the infiltration of bone and fusion to peripheral bone.<sup>3</sup>

**Biograft-HT**<sup>®</sup> is a biphasic calcium phosphate ceramic consisting of hydroxyapatite and beta tricalcium phosphate in ratio of approx. 60:40 that is biocompatible, nontoxic, resorbable, non-inflammatory and bioactive. It causes no immunological and foreign body response.<sup>1</sup> A convenient and economical approach to obtain autologous PDGF and TGF- $\beta$  is the use of platelet rich plasma (PRP). PRP is prepared by complex techniques using hematology cell separators and two step centrifugation to concentrate platelets. PRF is an autogenous source of various growth factors which is obtained by sequestering and concentrating drawn venous blood.<sup>4</sup>

## **Materials And Methods**

A total number of 88 sites in 32 subjects were selected for the study. Patients suffering from moderate to advanced periodontitis along with radiographic evidence of infrabony defect were selected for the study. The patients were explained the duration, course and outcome of treatment with alternative therapies, if possible.

## **Exclusion Criteria**

- Patients with a history of any systemic disease, interfering with the acceptance of the graft material and subsequent healing, or any other clinical contraindication for surgery.
- Patients who had used antibiotics within 6 months prior to surgery.
- Pregnant or lactating patients.
- Patients who were smokers and were not willing to quit.
- Patients with known allergy to drugs or materials.

## **Methodology**

Patients included in the study were divided into 2 groups.  
Group I: Defects treated with platelet rich fibrin (PRF)

Group II: Defects treated with biograft-HT® (60% synthetic hydroxyapatite and 40% beta tricalcium phosphate).

### **Presurgical Protocol**

The initial preparation phase of treatment consisted of oral hygiene instructions, scaling and root planing and any occlusal therapy as required. Re-evaluation 2 weeks after completion of initial therapy was done to confirm that an acceptable level of plaque control is maintained by the patients and the presurgical soft tissue measurement were recorded.

### **Investigated Clinical Parameters**

The following clinical parameters were recorded at baseline, 3 months post-operatively and 6 months post-operatively.

1. Plaque index
2. Gingival index
3. Pocket depth
4. Clinical attachment level

#### *Probing Measurements: Pocket Depth and Clinical Attachment Level*

A customized acrylic occlusal stent was prepared for each site to provide reproducible testing point and insertion axis. The stent was grooved in an occluso-apical direction to minimize variations in the direction of probing at subsequent recordings. The apical margin of the customized acrylic stent was used as the fixed reference point and the following measurements were recorded:

- Fixed Reference Point (FRP) to the Base of Pocket (BOP).
- Fixed Reference point to the Gingival Margin (GM).
- Fixed reference point to the Cemento-Enamel Junction (CEJ).

Reference point was used for better reproducibility. All clinical measurements were made by one examiner, using a manual calibrated UNC-15 periodontal probe. Measurements were made pre-operatively at baseline and post-operatively at 3 months and 6 months, for all the sites.

### **Radiographic-Assessment and Measurements**

The intraoral periapical radiographs of each defect site were taken pre-operatively and post-operatively using millimeter grid. Radiographic evaluations were done at baseline, 3 months and 6 months for the sites, as follows:

- Distance from CEJ to the base of defect was measured - A (at baseline). A1 was taken at 3 months post-operatively and A2 was taken at 6 months post-operatively.
- Distance from CEJ to alveolar crest was measured-B (at baseline). B1 was taken at 3 months post-operatively and B2 was taken at 6 months post-operatively.
- Defect depth was calculated as  $C = A - B$ ,  $C1 = A1 - B1$  &  $C2 = A2 - B2$  at baseline, 3 & 6 months respectively.

- Amount of defect fill was calculated as  $X1 = A - A1$  at 3 months and  $X2 = A - A2$  at 6 months, post-operatively.
- Percentage defect fill was calculated as  $D1 = (X1/A) \times 100$  at 3 months and  $D2 = (X2/A) \times 100$  at 6 months, post-operatively.
- Amount of defect resolution was calculated as  $Y1 = C - C1$  and  $Y2 = C - C2$  at 3 and 6 months respectively.
- Percentage of defect resolution was calculated as  $Z1 = (Y1/C) \times 100$  and  $Z2 = (Y2/C) \times 100$  at 3 and 6 months respectively.

### **Platelet Rich Fibrin**

Platelet rich fibrin was obtained by centrifugation of venous blood. 8 ml of blood was drawn from a peripheral vein of the patient and collected into sterilized test tubes, without anticoagulant and the test tubes were centrifuged immediately at 3000 rpm (approx.) for 10 minutes. Resultant product consists of following three layers:

1. Top most layer is acellular platelet poor plasma (PPP).
2. PRF clot in middle.
3. RBCs at the bottom

### **Biograft - HT<sup>®</sup> (IFGL Bioceramics Limited, Calcutta)**

Biograft-HT<sup>®</sup> is a biphasic calcium phosphate consisting of hydroxyapatite and  $\beta$ -Tricalcium phosphate in weight ratio of approximately 60:40. It is biocompatible, non toxic, resorbable, non-inflammatory, and bioactive. The granule size of this material ranges from 250-350 microns. This material is considered osteoconductive, as it serves as a scaffolding upon which host bone can grow.

#### *Preparation and Application of Graft Materials*

For Group I sites platelet rich Fibrin (PRF) was prepared. The middle layer of PRF was retrieved from the test tube and put in the dappen dish and then it was adapted to the defect site to reshape the alveolar crest profile with the help of plastic filling instrument.

In Group II, Biograft – HT<sup>®</sup> was placed into a sterile dappen dish and prepared by adding saline to obtain a paste like consistency. Then, small increments were added starting from the bottom of the defect and adapted well to its configuration. Every effort has been made to avoid contamination of the debrided root surface with saliva and blood.

After 7 to 10 days dressing, sutures and any plaque present in the area were removed. The recall appointments were scheduled at 3 months and 6 months post surgically for soft tissue evaluation, plaque control, radiographic evaluation and for recording of clinical parameters.

### **Results**

The statistical analysis was done using SPSS (Statistical Package for Social Sciences) Version 15.0 statistical Analysis Software.

Parameter	Group I		Group II		P	Sig.
	Mean	SD	Mean	SD		
PI	0.44	0.05	0.50	0.13	0.27	NS
GI	0.43	0.08	0.46	0.06	0.81	NS
PPD (mm)	5.02	0.60	5.23	0.83	0.90	NS
CAL (mm)	5.64	1.05	6.13	1.54	0.90	NS
Defect depth (mm)	6.24	2.02	5.27	1.72	0.18	NS

Table I: Comparison of Clinical and Radiographic Parameters in the three groups under study at baseline

Parameter	Group I		Group II		ANOVA		
	Mean	SD	Mean	SD	F	P	Sig.
Baseline	0.47	0.06	0.50	0.13	1.332	0.27	NS
3 months	0.50	0.05	0.52	0.14	1.526	0.22	NS
6 months	0.46	0.06	0.54	0.13	2.451	0.09	NS

Table II: Comparison of PI scores in the three groups at different time intervals

Parameter	Group I		Group II		p	Sig.
	Mean	SD	Mean	SD		
Baseline	0.44	0.06	0.47	0.05	0.81	NS
3 months	0.52	0.04	0.51	0.09	0.76	NS
6 months	0.49	0.09	0.50	0.11	0.90	NS

Table III: Comparison of GI scores in three groups at different time intervals

Parameter	Group I		Group II		p	Sig.
	Mean	SD	Mean	SD		
Baseline	5.51	0.62	5.44	0.81	0.90	NS
3 months	3.11	0.91	3.24	1.13	0.35	NS
6 months	2.24	0.66	2.54	1.21	0.62	NS

Table IV: Comparison of probing pocket depth in the three groups at different time intervals.

## Discussion

Periodontal regenerative procedures rely upon various classes of bone grafts. Mainly autogenous bone, allogenic bone, alloplastic material and xenografts are used.<sup>5</sup> Research has attempted to use biologically active molecules to achieve periodontal regeneration. The PRF is a platelet concentrate of biologic mediators which contains all the constituents of blood, favourable to healing and immunity, on a single fibrin membrane.<sup>6</sup> A total of 88 sites in 32 patients were selected in this study. Patients recruited in the study ranged between 24–55 years of age. Because of the slow rate of progression of chronic periodontitis, it usually becomes clinically significant in the third decade or later.<sup>7</sup>

The selection of patients with interproximal vertical defects was done using clinical and radiographic criteria similar to study conducted by Shirakata M *et al* (2008)<sup>8</sup>. All the patients underwent Phase-I therapy before being recruited in the

study. There is a sufficient body of evidence that successful Phase-I therapy leads to healthy gingiva and optimum plaque control, which is a prerequisite for desired results of periodontal regenerative procedure. <sup>5,9,10</sup>

Zohar *et al* (2005) <sup>11</sup> observed that surgical debridement of intraosseous defects lead to predictable increase in periodontal attachment of about 2.5 mm, with variable amounts of bone filling. Over filling of the graft material was avoided as overpacking may interfere with proper flap adaptation and its closure, thereby retarding healing and possibly resulting in loss of graft material.

According to Addy M <sup>12</sup> and Newmann MG <sup>13</sup> et al, chlorhexidine helps in reducing the bacterial load in the oral cavity and prevents plaque accumulation. The patients were scheduled for recall visits at 3 months and 6 months after surgery for the clinical and radiographical measurements. <sup>14</sup>

Plaque index scores were within the accepted norms and had FMPS of  $\leq 20\%$ . The patients who had full mouth plaque score  $> 20\%$  were excluded from the study <sup>15</sup> Though in all groups, the scores improved from baseline to 3 and 6 months (Table II), this could be probably due to the good patient compliance and proper oral hygiene maintenance.

Gingival index scores showed improvements from baseline to 3 and 6 months for all the 3 groups (Table III). Statistically significant improvement in intra-group gingival index scores was observed from baseline to 3 and 6 months.

There was no significant difference in mean probing pocket depth among groups at different time intervals (Table IV). Change in PPD from baseline to 3 and 6 months was highly significant in all three groups.

At 6 months the PPD reduction was highest in group I which may be due to the sustained release of growth factors <sup>16</sup>

When comparing CAL at 3 months, there was maximum gain in CAL in group II, Group I showed minimum CAL gain. At 6 months, Group II had the minimum CAL gain at 6 months. The above findings suggest that the healing response of the soft tissues is influenced not only by the release of growth factors from the platelets but also because of various factors i.e. migration, proliferation, differentiation and remodelling; and is also a result of the physical and chemical properties of graft material used. <sup>16</sup> PRF is known to have abundant polypeptides growth factors and the alloplastic materials by and large serve as inert scaffolds as is evident from the above results. <sup>17</sup>

The highest defect fill was observed in group I. The comparison of defect fill among the three groups at The above findings are though not in accordance with the earlier studies having used the various platelet concentrates (eg: PRP, PRF), alone or in combination with various allografts and alloplasts. In our study the PRF and the alloplast when used individually revealed better bone fill. Dori F *et al* (2008) <sup>18</sup> stated that the use of platelet concentrate may not yield any additional improvements when used in combination with other graft materials and/or GTR 3 months as well as 6 months was statistically non-significant.

The results showed that all the graft materials resulted in increased bone levels, significant defect resolution, increased attachment level and reduced probing depth. Measurements of the clinical and radiographic parameters are a bit contradictory in our study as was with some other similar studies. But, it must be noted that the radiopaque nature of the alloplast can mask the actual findings which always is a dilemma. This can only be overcome by re-entry procedures, which are practically and ethically not very acceptable. Many authors earlier have established that radiographic measurements and CAL are equally reliable in assessing the treatment outcome of periodontal bony defects. In other words, the use of CAL is by itself indicative of clinical variations in the periodontal condition as much as re-entry or radiographic evaluations. These findings do not in any way underestimate the value of such secondary outcome variables; however, it validates the conclusion of the present study which are based solely on the changes in clinical attachment level and probing depth over time.

### **Conclusion**

The mean change in PPD and CAL measurements were statistically significant from baseline to 3 and 6 months, in both the groups. The comparison of PPD and CAL measurements between the two groups at different time intervals revealed no statistically significant difference. The defect fill and the percentage defect fill from 3 to 6 months was statistically significant in two groups. Inter-group difference in the mean amount and percentage of defect fill at 3 and 6 months time period was statistically non-significant.

### **Bibliography**

- 1) Chandrashekar KT, Saxena C. Biograft-HT® as a bone graft material in the treatment of periodontal vertical defects and its clinical and radiological evaluation. *J Indian Soc Periodontol* 2009;13:138-144.
- 2) Trisi P, Rao W, Rebaudi A, Fiore P. Histologic effects of pure phase beta tricalcium phosphate on bone regeneration in human artificial jaw bone defects. *Int J Periodontics Restorative Dent* 2003;23:69-77.
- 3) Mefferet RM, Thomas JR, Hemilton KM, Brownstein CM. Hydroxyapatite as an alloplastic graft in the treatment of human periodontal osseous defects. *J Periodontol* 1985;56:63-73.
- 4) Okuda K, Tai H, Tanabe K, Suzuki H, Saito T, Kawase T, Saito Y, Wolff LF, Yoshie H. Platelet rich plasma combined with a porous hydroxyapatite graft for the treatment of intrabony periodontal defects in humans: A comparative controlled clinical study. *J Periodontol* 2005;76:890-898.
- 5) Kenney EB, Lekovic V, Han T, Carranza FA, Dimitrijevic B. The Use of a Porous Hydroxyapatite implant in periodontal defects I. Clinical results after six months. *J Periodontol* 1985;56:82-88.
- 6) Choukroun J, Dohan DM, Diss A, Dohan SL, Dohan AJJ, Mouhyi J, Gogly B. Platelet rich fibrin (PRF): a second generation platelet concentrate. Part IV: Clinical effects on tissue healing. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2006;101:E56-60.
- 7) Dohan DM, Choukroun J, Diss A, Dohan SL, Dohan AJJ, Mouhyi J, Gogly B. Platelet rich fibrin (PRF): A second generation platelet concentrate. Part II:

- Platelet related biological features. *Oral surg Oral Med Oral Pathol Oral Radiol Endod* 2006;101:E45-50.
- 8) Shirakata Y, Setoguchi T, Machigashira M, Matsuyama T, Furuichi Y, Hasegawa K, Yashimoto T, Izumi Y. Comparison of injectable calcium phosphate bone cement grafting and open flap debridement in periodontal intrabony defects. *J Periodontol* 2008;79:25-32.
  - 9) Mora F, Ohuhayoun JP. Clinical evaluation of natural coral and porous hydroxyapatite implants in periodontal bone lesions: results of a 1 year follow up. *J Clin Periodontol* 1995;22:877-884.
  - 10) Czuryzkiewicz-crana J, Banach J. Autogenous bone and PRP in the treatment of intrabony defects. *Advances in Med Sci* 2006;51:26-30.
  - 11) Zohar R, Tenenbaum HC, Perio D. How predictable are periodontal regenerative procedures? *JCDA* 2005;71(9):675.
  - 12) Addy M. The use of antiseptics in periodontal therapy. In: Lindhe J, Karring T, Lang NP. *Clinical periodontology and implant dentistry*. Blackwell Munksgard. 4th edition 2003;464-93.
  - 13) Newman MG. Effect of 0.12% chlorhexidine on bacterial recolonization after periodontal surgery. *J Periodontol* 1989;60:577-89.
  - 14) Reddy MS, Jeffcoat MK. Methods of assessing periodontal regeneration. *Periodontol* 2000. 1999;19:87-103.
  - 15) Slotte C, Asklo B, Sultan J, Norderyd O. A Randomized Study of Open-Flap Surgery of 32 Intrabony Defects With and Without Adjunct Bovine Bone Mineral Treatment. *J Periodontol* 2012;83:999-1007.
  - 16) Mazor Z, Horowitz RA, Del Corso M, Prasad HS, Rohre MD, Dohan Ehrenfest DM. Sinus floor augmentation with simultaneous implant placement using Choukroun's PRF as sole grafting material : a radiographic and histologic study at 6 months. *J Periodontol* 2009;80:2056-64.
  - 17) Yamamiya K, Okuda K, Kawase T, Hata K, Wolff LF, Yoshie H. Tissue engineered cultured periosteum used with PRP and hydroxyapatite in testing human osseous defects. *J Periodontol* 2008;79:811-818.
  - 18) Dori F, Huszar T, Nikolidakis D, Tihanyi D, Horvath A, Arweiler NB, Gera I, Sculean A. Effect of platelet rich plasma on healing of intrabony defects treated with beta tricalcium phosphate and expanded polytetrafluoroethylene membranes. *J Periodontol* 2008;79:660-669.