Clinical and cone beam computed tomography comparison of NovaBone Dental Putty and PerioGlas in the treatment of mandibular Class II furcations

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ORIGINAL RESEARCH

Clinical and cone beam computed tomography comparison of NovaBone Dental Putty and PerioGlas in the treatment of mandibular Class II furcations

Asmita, Vivek Gupta, Vivek Kumar Bains, GP Singh, Rajesh Jhingran

Department of Periodontology, Saraswati Dental College and Hospital, Lucknow, Uttar Pradesh, India

ABSTRACT

Objective: The objective of this study is to compare the putty form of bioactive glass (NovaBone Dental Putty) and particulate form (PerioGlas) in the resolution of Class II furcation defects.

Background: Use of bone regeneration materials is becoming common in periodontal surgeries including furcation defects and the promising role of bioactive allograft materials has encouraged their presentation in different morphologic forms with their own advantages and disadvantages giving the operator ample of choices in his/her periodontal armamentarium.

Materials and Methods: A total of 28 patients with 40 Class II furcation defects were enrolled in the study and were randomly allocated to two groups with 20 sites in each group. Measurement of defects was done using clinical and cone beam computed tomography (CBCT) methods. The patients were followed-up at 6 months. Intergroup comparisons were done using Mann-Whitney U-test.

Results: There was no significance between group differences in clinical parameters and defect size at the baseline. After 6 months, particulate form showed a mean resolution of 50.48 ± 16.47% and 51.11 ± 9.48%, respectively for vertical defect and horizontal defect while putty form showed a mean resolution of 43.48 ± 9.33% and 42.88 ± 11.09%, respectively. Mean resolution in furcation width was 40.15 ± 13.00% for particulate form as compared with 36.27 ± 11.41% in putty form. Statistically, there was no significant difference between two groups except for the horizontal defect fill where PerioGlas showed statistically better results.

Conclusion: Putty form was comparable to particulate form for resolution of Class II furcation defects.

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Key words: Cone beam computed tomography, furcation defect, NovaBone Dental Putty, PerioGlas

Management of moderate to advanced furcation invasions presents one of the major challenges in periodontal treatment. A number of studies conducted in the past three decades have shown that Class II furcation defects respond favourably to regenerative procedures in a predictable manner. Numerous surgical modalities with various graft materials thereby have been tested in an attempt to achieve regeneration of these defects.[1-3] One such synthetic material is the calcium phosphosilicate bioactive glass, developed by Hench and West[4] in the late 1960s, which has been used for the treatment of periodontal defects due to its reported advantages of forming a strong bond with living tissues both bone and soft connective tissue and to its modulus of elasticity similar to that of bone.[5]

Bioactive glass is available in different morphological forms like particulate, and putty. The particulate form is available in two different particle sizes 300-355 μm (BioGran) and 90-710 μm (PerioGlas). Recent reports in the literature have demonstrated that bioactive glass particulate (PerioGlas) may support regeneration in furcation and intrabony defects by its osteostimulating mode of action and there was a greater improvement in clinical index for the defect treated with PerioGlas than in those treated with open flap debridement surgery.[6-9]

NovaBone Dental Putty is a new, next generation calcium phosphosilicate bone graft material built from a

Address for correspondence:
Dr. Vivek Gupta
E-mail: drvivek10feb@gmail.com

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bioactive glass platform with additives like polyethylene glycol and glycerine to improve handling and efficacy. The particulate and binder are provided premixed as a pliable cohesive material. On implantation, the binder is absorbed to permit tissue infiltration between the bioglass particles. The particles are slowly absorbed and replaced by new bone tissue during the healing process. This osteostimulation results in new bone formation throughout the grafted site at rates faster than those seen with other synthetics.[10]

In the field of periodontology, assessment of the condition of teeth and surrounding alveolar bone depends largely on two-dimensional imaging modalities such as conventional and digital radiography. Recently, cone beam computed tomography (CBCT) was introduced for head and neck applications. CBCT images demonstrate a high accuracy in assessing the furcation involvement. A sagittal, axial and coronal image clearly shows the size, morphology of furcation involvement in each plane providing measurements regarding vertical height, horizontal depth and width of furcation involvement, not possible with conventional radiographic methods. Thus, using CBCT for assessment of furcation may offer new perspectives on periodontal diagnosis and treatment planning.[11,12]

To the best of our knowledge, until date, literature lacks any studies where the putty form of bioactive glass (NovaBone Dental Putty) has been compared with particulate form (PerioGlas) in the treatment of Class II mandibular furcation defects using CBCT as radiographic assessment. Therefore, this study was undertaken with the objective of evaluating the regenerative potential of two bioactive glasses in the treatment of mandibular Class II furcation defects.

MATERIALS AND METHODS

This study was conducted in the Department of Periodontology, Saraswati Dental College and Hospital, Lucknow, Uttar Pradesh, India, during the period between December 2010 and November 2012. Ethical clearance was obtained from Saraswati Dental College's Human Research Ethical Committee. After ethical approval, all patients received verbal information regarding the study protocol and written informed consent was obtained for participation in the study.

The patients were selected based on the following inclusion criterions. Systemically healthy patients within the age group 30-65 years suffering from moderate to severe generalized chronic periodontitis, buccal Class II furcation defects in mandibular first and second molars with ≥3 mm horizontal probing depth[13] and gingival margin coronal to or at the level of the roof of furcation, patients who had not taken antibiotics within 6 months, nonmobile teeth and compliant patients with full mouth plaque score 0.1-0.9 (good oral hygiene during Phase I therapy). Smokers, pregnant and lactating mothers, history of periodontal surgery within 6 months, inadequate endodontic treatment and/or restorations and lingual Class II furcation defects were the exclusion limits.

Study design

For this randomized clinical study, a total of 40 sites on 28 patients, meeting the selection criteria were opted and were equally divided into two groups (n = 20). After completion of Phase I therapy, on the selected patients the surgery was randomly assigned by the toss of a coin to receive either NovaBone Dental Putty or PerioGlas-bioactive glass particulate. Customized acrylic occlusal stents were prepared to provide reproducible testing points and insertion axes. Before surgery a CBCT was taken as baseline radiographic assessment.

Cone beam computed tomography imaging

For our study, CBCT (Newtom 3G Cone Beam X-ray Technology QR DVT 9000 SRL, AFP Imaging Company, Verona, Italy) with large field-of-view (FOV) (FOV_{max} of 20 × 20 × 20 cm) equipped with three-dimensional image reconstruction software package, NNT (version 2.499, QR SRL, Verona, Italy) was used for CT scanning and image reconstruction installed at the Department of Oral Maxillofacial Surgery, Faculty of Dental Sciences, King George Medical University, Lucknow. Data were captured at a resolution of 0.4 mm voxel size and exposure time of 20 s scanning (110 kVp, 2.6 mA and 13.6 mA s). Images were then obtained in sagittal and coronal sections at constant slice thickness of 1 mm. The present investigation used 1.0 mm slices because this increment closely mimics the same error of measurement when using a periodontal probe and because smaller slices decreased the image resolution.

Radiographic parameters

The following calculations were made from the coronal and sagittal sections of CBCT at baseline and 6 months postsurgery.

Coronal section of cone beam computed tomography

Horizontal depth of furcation (H-DF): The perpendicular distance in the furcation area from the tangent connecting the most prominent portion of the tooth crown and the buccal cortical plate.

Sagittal section of cone beam computed tomography

- Vertical height of furcation (V-HF): The distance between the fornix to the crest of alveolar bone within the furcation

- Furcation width (Fw): Width of the furcal orifice at its base, measured in a horizontal dimension at the level of the alveolar crest within the furcation
- Root trunk length (RTL) (cementoenamel junction [CEJ] line-Fx): The distance from CEJ line to the fornix.

All the CBCT scans were taken by a single trained technician pre- and post-surgery. A calibration exercise was performed to obtain accurable intraexaminar consistency in CBCT measurements. The voltage, current, exposure time and detection field were kept constant for each patient at both the time of exposure. The reference chosen to standardize the axial and sagittal planes was the bispinal line, coinciding with the vertical and horizontal planes, respectively. The reference employed to standardize the coronal plane was the line between the infraorbital points, named the infraorbital line, thus concluding the positioning of images over the three spatial planes. The sagittal and coronal sections were reconstructed after 6 months at the same axial slicing to that of the baseline. Duplicate measurements were always made and their mean considered as a final value.

Clinical parameters

The clinical parameters were recorded with the help of a University of North Carolina-15 probe and Nabers probe with rubber stopper for each surgical site before surgery that is, intrasurgical (baseline) and 6 months postsurgery. The apical end of the vertical groove of the stent was used as fixed reference point (FRP). Three soft tissue measurements were recorded viz.: Probing pocket depth (PPD), clinical attachment level (CAL) and height of gingival recession (GR).

Hard tissue measurements

Hard tissue measurements were taken at baseline during surgery (intrasurgical) and at 6 months postsurgery through bone sounding or transgingival probing method.

- V-HF: Was noted by measuring the difference between the FRP to base of furcation and FRP to fornix of the furcation defect
- H-DF: Was noted from the tangent of the roots adjacent to the furcation to the horizontally deepest part of the furcation, taken during surgery before the placement of graft with the Nabers probe having rubber stopper. Six months postsurgery transgingival probing was done with the Nabers probe having rubber stopper from which the width of the gingiva was substracted.

Surgical procedure

After administration of local anesthesia (2% xylocaine with 1:80000 adrenaline, a crevicular incision was given and a full-thickness flap was elevated. The defect was thoroughly debrided followed by root planing. The acrylic stent was then put in place and the measurement of the defect was recorded. Before the placement of the graft, a 3-0 nonresorbable silk suture was passed through the buccal and lingual papillae and the suture was left loose. Then the chosen graft material was placed into the furcation defect with the help of a graft filling instrument and was condensed in place to a level of the plane connecting the eminences of the root surfaces adjacent to the furcation defect. Care was taken so as not to overfill the defect beyond this reference plane. Clinical example is shown in Figures 1-4. Finally, approximation of lingual and buccal flaps were done using interrupted sutures and a periodontal dressing (Coe-Pak) was placed on the surgical area. Post surgically all the patients were prescribed systemic antibiotics amoxicillin 500 mg thrice daily and paracetamol 500 mg 2 times a day for 5 days and postoperative instructions were given to all patients and were instructed to report to the department after 24 h of surgery and then after 10 days for Coe-Pak and sutures removal. Patients were recalled at monthly intervals until 6 months. At each visit, oral hygiene instructions were reinforced, supragingival scaling was done if required. Clinical and radiographic measurements were repeated at 6 months postoperatively.

Statistical analysis

The statistical analysis was performed using Statistical Package for Social Sciences version 15.0 statistical analysis software (IBM, Chicago, IL). The values were represented in mean ± standard deviation and number (%). Inter group comparison was done using Mann-Whitney U-test. Within group change was evaluated using Wilcoxon signed rank test.

RESULTS

All the patients were compliant, and healing was uneventful for both groups. Baseline analysis did not demonstrate any significant difference between groups for any of the assessed variable, suggesting any final differences between treatment groups were not influenced by initial defect characteristic, thus allowing posttreatment results to be compared. Table 1 presents statistical analysis for various soft- and hard-tissue parameters for Group I and II at baseline and 6 months as measured clinically and radiographically. A significant reduction in PPD and gain in CAL were observed for both the groups from baseline to 6 months indicating the clinical efficacy of both forms of the graft materials. The reduction in vertical height and H-DF were also observed to be statistically highly significant for both groups post surgically measured clinically as well as radiographically through CBCT. Similarly, change in Fw as measured radiographically was statistically highly significant for both the groups postsurgical intervention.

Table 2 presents intergroup comparison of change in furcation defect resolution in all the three dimensions viz. vertical, horizontal including width of furcation defect. The percentage vertical defect fill (%VDF) observed for Group I was nearly 43% by both clinical and radiographic

measurements and for Group II it was 50.48% and 44.14% by clinical and radiographic measurements, respectively. However, intergroup comparison was statistically nonsignificant. There was a statistically significant difference observed for percentage horizontal defect fill (%HDF) for Group II as compared with Group I indicating the superiority of PerioGlas particles over the putty form for horizontal parameters. The furcation width resolution (FwR) observed both clinically and radiographically showed nonsignificant differences between the two groups. A radiographic example is shown in Figures 5-8.

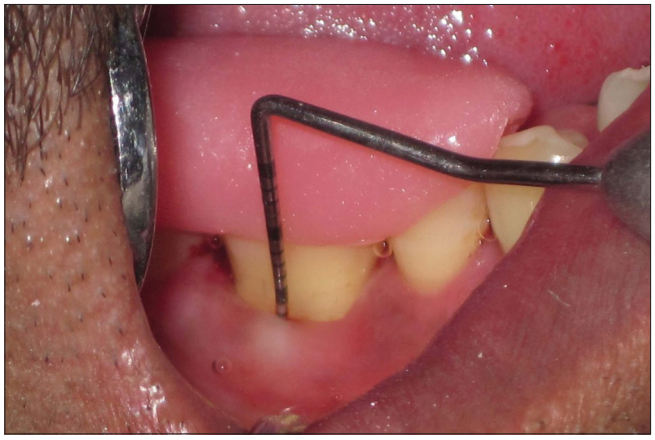

Figure 1: Clinical photographs for Group I (NovaBone Dental Putty) at baseline

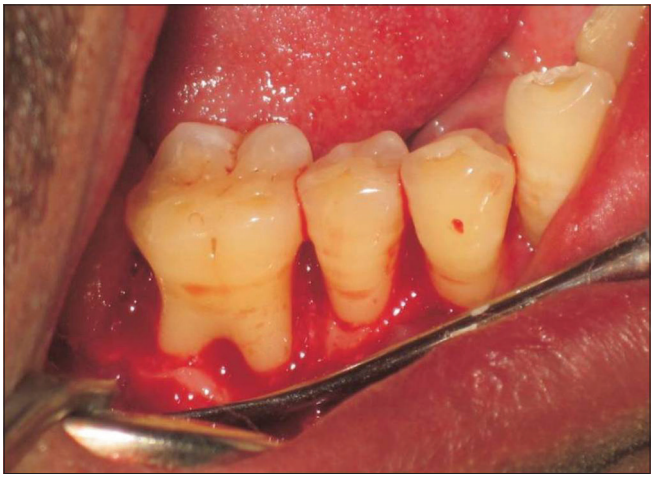

Figure 2: Clinical photographs for Group I (NovaBone Dental Putty) after flap reflection

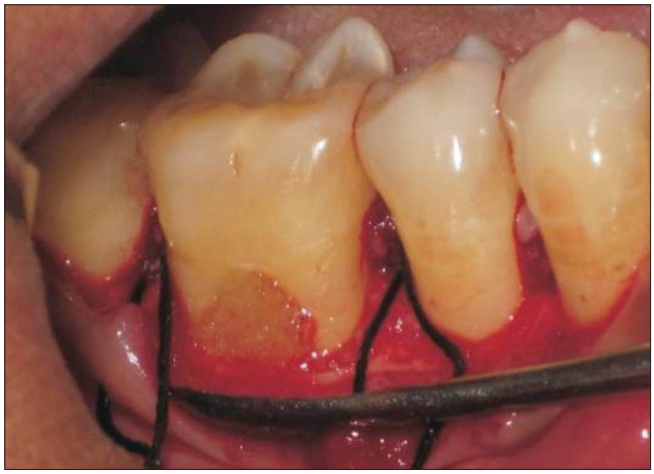

Figure 3: Clinical photographs for Group I Placement of NovaBone Dental Putty

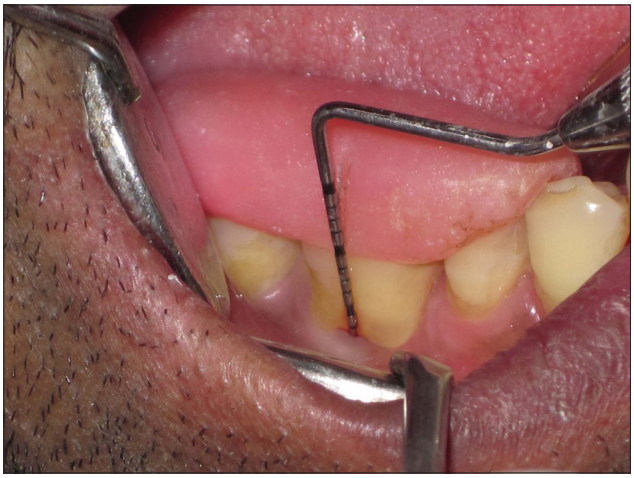

Figure 4: Clinical photographs for Group I (NovaBone Dental Putty) after 6 months

Table 1: Means and SD (mm) of various soft- and hard-tissue parameters for Group I and II as measured clinically and radiographically

Parameters	Group I				Group II			
	Baseline	6 months	Change	*P* value	Baseline	6 months	Change	*P* value
Clinical measurements								
PPD	3.53±1.06	1.87±0.64	1.67±0.82	<0.001	3.87±1.36	1.80±0.67	2.06±0.88	<0.001
GR	1.40±0.75	1.93±1.28	0.53±0.74	0.021	1.47±0.64	1.81±0.64	0.34±0.63	0.017
CAL	-	2.87±1.19	1.80±0.78	0.001	5.20±1.32	2.87±0.74	2.33±0.90	0.001
V-HF	4.13±1.06	2.33±0.82	1.80±0.56	<0.001	4.53±1.92	2.53±1.92	2.0±0.0	<0.001
H-DF	4.07±0.70	2.33±0.62	1.73±0.46	<0.001	4.60±0.63	2.27±0.59	2.33±0.49	<0.001
Radiographic measurements								
V-HF	4.05±0.88	2.24±0.75	1.81±0.71	0.001	4.60±1.40	2.74±1.50	1.85±0.53	0.001
H-DF	4.06±0.76	2.67±0.52	1.39±0.58	0.001	4.45±0.53	2.18±0.40	2.27±0.53	0.001
Fw	3.82±1.09	2.44±0.77	1.38±0.59	0.001	3.59±0.67	2.17±0.79	1.41±0.45	0.001
RTL	6.46±1.58	-	-	-	6.23±1.92	-	-	0.567

PPD=Probing pocket depth, GR=Gingival recession, CAL=Clinical attachment loss, V-HF=Vertical height of furcation, H-DF=Horizontal depth of furcation, Fw=Furcation width, RTL=Root trunk length, SD=Standard deviation

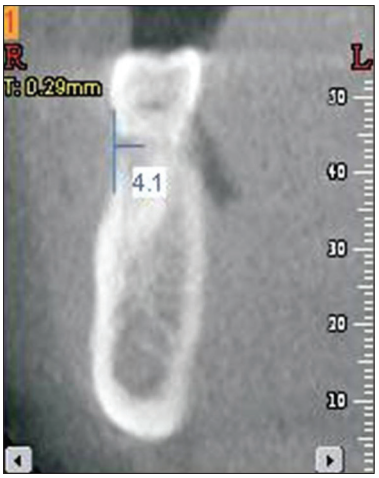

Figure 5: Cone beam computed tomography for Group II (PerioGlas) coronal view at baseline (4.1 = horizontal depth of furcation)

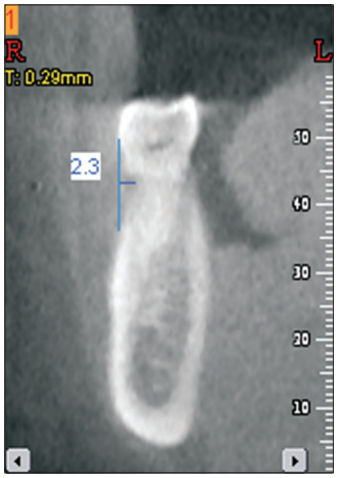

Figure 6: Cone beam computed tomography for Group II (PerioGlas) coronal view at 6 months (2.3 = horizontal depth of furcation)

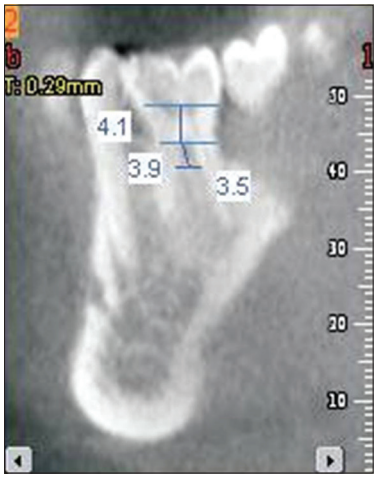

Figure 7: Cone beam computed tomography for Group II (PerioGlas) sagittal view at baseline (4.1 = root trunk length; 3.9 = vertical height of furcation; 3.5 = furcation width)

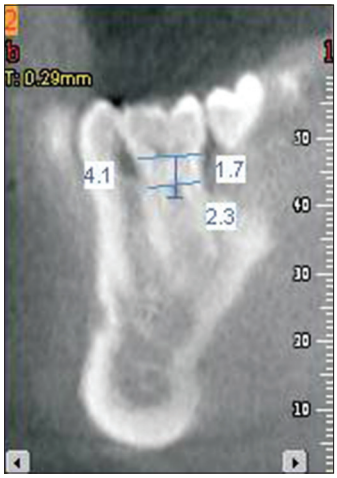

Figure 8: Cone beam computed tomography for Group II (PerioGlas) sagittal view at 6 months (4.1 = root trunk length; 1.7 = vertical height of furcation; 2.3 = furcation width)

Table 2: Intergroup comparison of change (from baseline to 6 months) in various soft- and hard-tissue parameters for Group I and II

Parameters	Group I	Group II	*P* value
Clinical measurements			
PPD	1.67±0.82	2.07±0.88	0.187
GR	0.53±0.74	0.33±0.72	0.567
CAL	1.80±0.77	2.33±0.90	
VDF	1.80±0.56	2.00±0.00	0.367
%VDF	43.48±9.33	50.48±16.47	0.217
HDF	1.73±0.46	2.33±0.48	0.016
%HDF	42.88±11.09	51.11±9.48	0.011
Radiographic measurements			
VDF	1.81±0.70	1.85±0.53	0.902
%VDF	42.97±15.20	44.15±14.06	0.838
HDF	1.39±0.58	2.27±0.54	<0.001
%HDF	33.54±12.37	50.79±9.05	<0.001
FwR	1.38±0.59	1.41±0.45	0.902
%FwR	36.27±11.41	40.14±13.00	0.539

PPD=Probing pocket depth, GR=Gingival recession, CAL=Clinical attachment loss, VDF=Vertical defect fill, HDF=Horizontal defect fill, %VDF=Percentage vertical defect fill, %HDF=Percentage horizontal defect fill, FwR=Furcation width resolution, % FwR=Percentage furcation width resolution

DISCUSSION

Furcations are generally less responsive to therapy than nonfurcated areas and/or single rooted teeth. Nevertheless, furcation lesions are well-established and documented model for clinical evaluation of regenerative techniques, especially mandibular molars.[14] The efforts to obtain optimum regeneration of furcation defects have created a renaissance of research in the utilization of autologous, allogenic and several alloplastic regenerative materials. Bioactive glasses are fairly new alloplastic materials developed by Hench and West[4] that have seen their multiple applications in dentistry in the treatment of bone defects, ridge and socket preservations and periodontal osseous defects including furcation defects.[15]

Commercially, bioactive glasses are available in different morphologic forms. Recently, a putty form of premixed composite of bioactive calcium silicophosphate has been made available for dental usage by the name of NovaBone

Dental Putty. It has found its clinical applications in the treatment of intrabony defects, extraction socket preservation, sinus elevations procedures and in implant surgeries. However, until date, there is little documented literature available for the use of NovaBone Putty in furcation defects. The paucity of literature for the use of putty form of bioactive glass in the treatment of furcation lesions made us interested to study this particular material. With this rationale the present study had been carried out to evaluate the regenerative potential of two different morphologic forms of bioactive glasses that is NovaBone putty versus PerioGlas particulate in the treatment of buccal Class II mandibular molar furcation defects.

The efficacy of CBCT for measuring the periodontal osseous defects including furcation have been detailed and validated by several researchers in the past.[16,17] A study conducted by Young II Suh *et al.*[18] in determining the depth of Class II furcation defects has strongly suggested that bone sounding/ transgingival probing can be substituted for open bone level measurements (intrasurgical or surgical re-entry) in regenerative study of Class II furcation defects. With these studies as our background support for the measurements of furcation defects we conducted a transgingival method as clinical and CBCT for radiographical furcation analysis in our present study. Results obtained from our study indicated that both forms of bioactive glass, that is, putty and particulate regenerated furcation defects effectively as determined by various soft-and hard-tissue parameters.

There was a significant reduction in PPD in both groups from baseline to 6 months [Table 1]; however, the intergroup comparison in change of PPD at 6 months showed nonsignificant results [Table 2]. Our results are concurrent with the results obtained by Anderegg *et al.*[9] and Yukna *et al.*[19] who also achieved significant PPD reduction with PerioGlas in mandibular furcation defects. The mean increase in GR observed from baseline to 6 months for Group I was 0.53 ± 0.74 mm and 0.34 ± 0.63 mm for Group II, which was stastistically significant independently. These findings corroborate well with the results obtained by Humagain *et al.*[20] who showed a mean increase of 0.50 mm in GR when PerioGlas was used in furcation defects. While an increase in GR observed in our study was less than that recorded by Froum *et al.*[7] this difference could be attributed to the fact that their study was of 12 months duration. The increase in GR might be attributed to the shrinkage of gingival tissues with the resolution of inflammation. The higher gain in CAL (2.33 ± 0.90 mm) for Group II as compared with Group I (1.80 ± 0.78 mm) correspond well with the high reduction in PPD observed in Group II. Our findings are in accordance with the studies conducted by Froum *et al.*[7] and Humagain *et al.*[20]

Clinically, there was a significant mean reduction, in V-HF (also the VDF) by both groups [Table 1] which upon intergroup comparison showed statistically nonsignificant result (P = 0.367). Similarly, the %VDF albeit higher for Group II (50.48%) as compared with Group I (43.48%) was nonsignificant statistically (P = 0.217). Similar to our study Yukna *et al.*[19] found 47% of VDF with PerioGlas and Humagain *et al.*[20] observed a mean VDF of 1.5 mm with PerioGlas in the treatment of mandibular Class II furcation defects. The mean reduction in H-DF (also the HDF) observed at 6 months for Group I was 1.73 ± 0.46 mm and 2.33 ± 0.49 mm for Group II which was highly significant statistically (P < 0.001). These results imply that both groups showed a very high significant HDF. However, upon intergroup comparison contrary to the results of VDF, the HDF for Group II was significantly higher (P = 0.016). The %HDF observed for Group II was 51.1% as compared with 42.88% for Group I which again on intergroup comparison showed statistically significant results (P = 0.011). These findings show better as well as statistically significant HDF by PerioGlas as compared to NovaBone Dental Putty. The % HDF was found to be in concordance with the study performed by Humagain *et al.*[20] The hard tissue assessment was also done with CBCT. Radiographically the mean VDF as well as % VDF for both groups was found to be significant independently which upon intergroup comparison was nonsignificant. Similarly, a statistically significant higher mean HDF and % HDF was observed for Group II similar to the observation found clinically. The mean FwR for Group I was 1.38 ± 0.59 mm and 1.41 ± 0.45 mm for Group II which was statistically significant independently. However, on intergroup comparison this change was found to be nonsignificant statistically. As the literature lacks any study where FwR has been evaluated radiographically, direct comparisons therefore cannot be made.

Complete furcation closure, that is, 100% resolution could not be achieved in any of the sites in our study. This is in agreement with the majority of studies that showed inconsistency of complete furcation closure like Becker *et al.*,[21] Machtei and Schallhorn.[22] and Evans *et al.*[23] In our study, no furcation was completely filled as there was always some amount of horizontal and vertical component of the furcation lesion present postoperatively. This implies that both these forms of regenerative materials show partial regeneration. To what extent such partial gain promotes the longevity of the tooth remains to be studied.

According to Jepsen *et al.*[24] reductions in H-DF and thereby HDF was considered as primary parameter for regeneration of mandibular Class II furcation defects. In our study, sticking to the criteria of Jepsen *et al.* it is interesting to note that out of all three parameters for furcation defect resolution (viz. V-HF, H-DF and Fw) only horizontal parameter showed statistically significant results between the two groups. Though the H-DF was reduced by both the materials significantly, the mean HDF and %HDF was significantly higher for PerioGlas as

compared with NovaBone Dental Putty upon intergroup comparison. These results imply that PerioGlas has shown statistically higher and clinically better results for furcation defect resolution. Defect characteristics that influence the result of regenerative therapy in Class II furcation defects have been detailed by Bowers *et al.*,[25] Tsao *et al.*[26] and Eickolz *et al.*[27] Out of many defect characteristics these authors concluded that wide furcations respond less well to regenerative therapy than narrow furcations. The mean Fw of 20 sites in our study for Group I was 3.82 mm at the baseline when compared with 3.59 mm in Group II. Secondly a long RTL is another factor cited that negatively influences therapy results when furcations are involved; with long root trunks an advanced stage of bone resorption is necessary to cause furcations to be affected at all as stated by Eickolz *et al.*[27] The mean RTL at baseline in Group I was 6.460 mm as compared with 6.233 mm in Group II. These two parameters viz. greater Fw and more RTL for NovaBone Putty group might be the possible explanations to show slightly inferior regenerative therapy results as compared to PerioGlas group.

Two different modes of measuring the furcation defect fill have been adopted in our study, one clinical and the other radiographical method by CBCT. A bivariate correlation statistically was applied between the two methods (data not shown) and a strong correlation between the clinical and CBCT measurements of furcation defect at the baseline and a moderately strong correlation at the 6 months period was found. The results imply that CBCT offers noninvasive, reproducible and reliable method of measuring furcation defects as also documented and well supported by Ito *et al.*,[16] Misch *et al.*[17] and Walter *et al.*[28] Moreover CBCT was able to measure the furcation defect horizontally, not possible by any other radiographic method. Thereby, we strongly recommend the usage of CBCT for studies involving the furcation analysis.

NovaBone Dental Putty is a new, next generation calcium phosphosilicate bone graft material developed by the manufacturer over its previous particulate version (PerioGlas) with additives claimed to improve the handling and efficacy. However, we did not found any major handling ease for putty as compared with PerioGlas. The particulate form was equally retentive in the furcation defects. Probably the contained (cul-de-sac) nature of the buccal Class II furcation defects did not give any superior edge for the putty form of the bioactive glass. Nevertheless as discussed previously, the greater Fw and RTL might have contributed to slightly inferior results shown by putty group. Our study results indicate that morphological variation of bioactive glass does not offer any added advantage. In one animal study conducted by Wang *et al.*[10] who compared histologically the bone regeneration efficiency between PerioGlas and NovaBone Dental Putty found that at 6 weeks putty form showed greater bone content than particulate. However, at 12 weeks both groups resulted in equal bone fill. Since ours is clinical study performed on humans, direct comparisons cannot be made. Though putty form contain the same active ingredient, that is, bioactive glass but due to addition of additives such as polyethylene glycol and glycerine the percentage of glass particles reduces, which might again explain partially for slightly inferior results shown by putty in our study.

The improved clinical soft- and hard-tissue response at the grafted sites may be a function of the chemical reactivity of the two materials having similar basic constituent that is, bioactive glass. No adverse tissue reaction was observed in the treated surgical sites, implying that both the materials are biocompatible, safe, and well-tolerated.

CONCLUSION

Results of this study demonstrated that the use of both the forms of bioactive glass that is, putty and particulate effectively regenerated Class II furcation defects with an uneventful healing of the sites. Our results are based on single centered small sample size population, with clinical and radiographic assessment. Long-term multicenter randomized controlled clinical trials along with histologic evidence are warranted to further explore the potential of bioactive glass (both putty and particulate form) as a periodontal regenerative material.

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