ORIGINAL RESEARCH

Case-control Study: Comparative Evaluation of Bio active Glass (Novabone Putty) and Demineralized Freeze-dried Bone Allograft in the Treatment of Mandibular Furcation Defects

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Abstract

Aim: The aim of this study was to compare a second-generation bioactive glass putty biomaterial (Novabone putty) against demineralized freeze-dried bone allograft (DFDBA) in mandibular grade II furcation defects.

Materials and methods: Fifteen systematically healthy individuals in the age range of 38–50 years were selected for this split-mouth study. Group I consisting of 15 sites, was treated with DFDBA and group II consisting of 15 sites was treated with Novabone putty (NB putty). The clinical parameters recorded at 0, 3 and 6 months included plaque index (PI), gingival index (GI), probing pocket depth (PPD), relative vertical attachment level (RVAL) and relative horizontal attachment level (RHAL). Standardized intraoral periapical radiographs were taken at all 30 sites pre-and 6 months post-operatively.

Results: Probing pocket depth reduced significantly ($p = 0.001$) when baseline values were compared to 3 and 6 months postoperatively. In group II mean RVAL changed from 6.56 $\pm$ 1.44 at baseline to 4.80 $\pm$ 1.14 at 3 months and 4.80 $\pm$ 1.33 at 6 months which was found to be highly significant (HS) ($p = 0.001$). The mean RHAL also showed a significant difference when baseline values were compared to 6 months post-operatively in both the groups. With respect to defect depth and bone density, no significant difference was found between the two groups.

Conclusion: Significant improvement of the clinical parameters were seen in both the groups. As both the groups showed increase in defect fill and bone density, it can be summarized that NB putty seems to have comparable regeneration property to that of DFDBA when used for mandibular grade II furcation defects.

Clinical significance: The ease of use and higher level of biological performance of second-generation bioactive glass putty make it an ideal graft material.

Keywords: Bioactive glass, Case-control study, Demineralized freeze-dried bone allograft, Furcation defects, Periodontal regeneration.

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Introduction

Chronic periodontitis is a gradually progressing disease, resulting in inflammation within the supporting tissues of the teeth, progressive attachment loss (AL), and bone loss.[1]

Once the periodontal disease progresses, bone destruction extends to the furcation of multi-rooted teeth, causing furcation involvement. Management of the furcation involvement represents the most challenging scenario owing to the difficulty of achieving a predictable improvement regardless of the type of periodontal therapy.[2]

Choice of therapy depends on the degree of furcation involvement. Grade I furcation defects can be managed by scaling and root Planning alone, while grade II furcation defects call for the use of several regenerative techniques.[3] Literature search shows that a wide range of graft materials have been clinically used, including allografts, xenografts and synthetic and semisynthetic materials, for the treatment of furcation involvements.[4–6]

Demineralized freeze-dried bone graft is the most extensively used allograft material, in part due to its availability, safety, osteoinductive and osteoconductive properties.[7,8] Healing following the use of demineralized freeze-dried bone allograft (DFDBA) follows a highly governed cascade of events, ultimately resulting in cellular migration, differentiation and synthesis of bone.[9,10] Amongst the synthetic bone substitutes that have been investigated, calcium phosphosilicate bioactive glass has been used extensively due to its reported advantages.[11]

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). Bioactive glass particulate (PerioGlas) may support

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regeneration in furcation and intrabony defects by its osteostimulating mode of action.[12]

Nova Bone dental putty (NB Putty) is a unique, next generation calcium phosphosilicate bone graft material built from a bioactive glass platform with additives like polyethylene glycol and glycerine to improve handling efficacy. Nova Bone putty is dispensed as a pliable cohesive material which binds the binder and the particulate. Once implanted into the site, the binder is absorbed, thereby permitting the tissue infiltration between the bio-glass particles. During the healing phase, the particles get absorbed, which get replaced by new bone. This replacement is accredited to osteostimulatory capacity of bioactive glass.[13]

This study aspired to clinically evaluate the outcome of the DFDBA and bioactive synthetic Nova-Bone putty in the treatment of mandibular grade II furcation defects.

Materials and Methods

The current study was carried out in Department of Periodontology of Awadh Dental College and Hospital from April 2022 to April 2023 after acquiring ethical consent from the Institutional Ethical Committee (ADCH/IEC/PER/22-23/28) following the ethical standard guidelines in the 1964 declaration of Helsinki revised in 2013.

About 15 systematically healthy individuals, 8 males and 7 females aged between 38 and 50 years presenting with bilateral mandibular Grade II furcation defects according to Glickman's classifications were recruited for the study. The sample size calculation was done using G* power v 3.1.9 (Germany) software, and considering the α error as 5% and the power of the study as 90%.

Inclusion Criteria

- Systemically healthy individuals in the age-group between 38 and 50 years.
- Presence of bilateral mandibular grade II furcation defects-clinically permitting only partial penetration of the probe into the furcation.
- Radiographic evidence of bilateral furcation defects in the mandibular molar.
- Patients who had not received any type of periodontal therapy in the previous 6 months prior to the study.

Exclusion Criteria

- Patients taking medications such as corticosteroids, calcium channel blockers and immunosuppressive drugs, which are known to interfere with periodontal wound healing.
- Patients who are allergic to any medications.
- Pregnant and lactating mothers.
- Patients using tobacco in any form.
- Patients showing unacceptable oral hygiene maintenance after phase I therapy.

The selected subjects were assigned to respective treatment groups (group I and group II) using a coin-toss randomization. A split-mouth design was adopted, corresponding to the type of graft material rendered to them at an interval of 2 weeks.

Group I – consisting of 15 furcation defects to be treated by DFDBA.

Group II – consisting of 15 furcation defects to be treated by bioactive glass (NB Putty).

After preparing the study casts, fabrication of customized acrylic stents was done to record the clinical parameters.

The clinical parameters recorded at 0, 3, and 6 months include plaque index (PI), gingival index (GI), probing pocket depth (PPD), relative vertical attachment level (RVAL) measured using the UNC-15 probe and relative horizontal attachment level (RHAL) measured using Naber's probe rounding to the nearest 0.5 mm. Standardized Intraoral Periapical radiographs were taken at all 30 sites. Radiograph assessment was done by examining the linear distances from the cementoenamel junction (CEJ) to the base of the defect and from CEJ to the crest of the alveolar bone. Bone density was measured in Grayscale units (Fig. 1).

Four weeks after phase I therapy (scaling and root planing) each subject was reexamined, and baseline data were recorded just prior to the surgical procedure.

After achieving adequate local anesthesia (2% xylocaine, 1:2,00,000), a sulcular incision was given on the buccal and lingual aspect of 2 teeth anterior and one tooth posterior to the defect site. Full thickness mucoperiosteal flap was elevated with the help of periosteal elevator to gain access to furcation defects. Debridement was performed using site specific and universal curettes, and presuturing was done to prevent the graft displacement.

In group I DFDBA bone granules were placed into the defect, and condensed until the defect was filled. The flaps were stabilized in their original position with the help of simple interrupted sutures (4–0 Silk) and periodontal dressing was given.

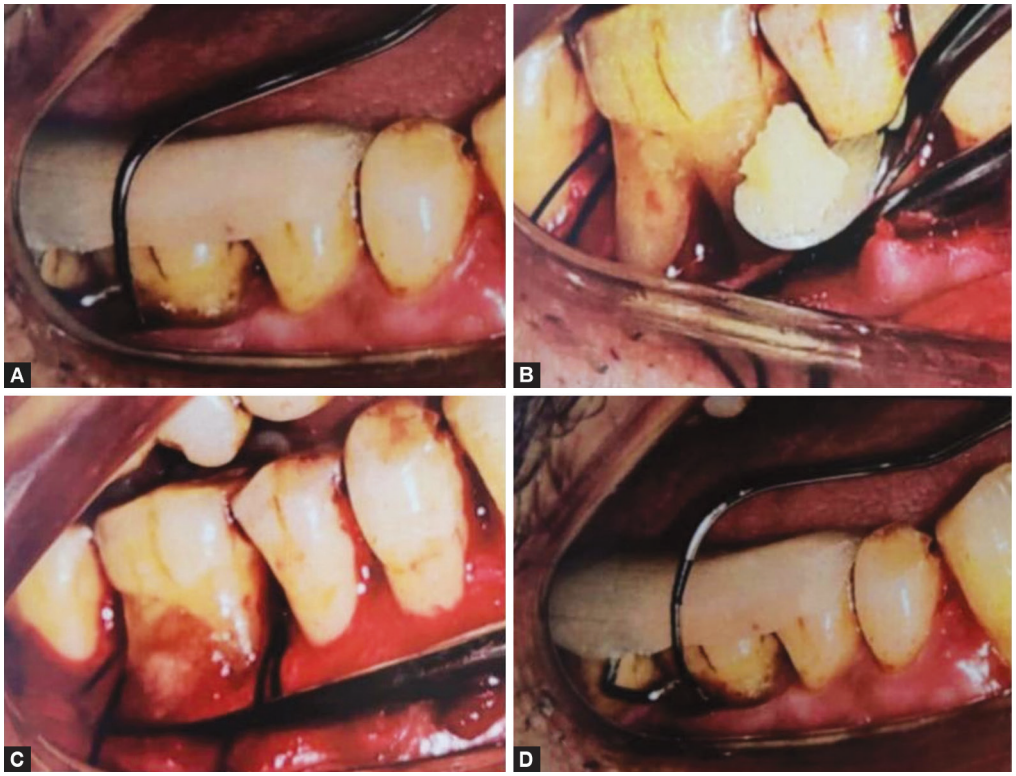
In group II following a similar surgical protocol, bioactive glass (NB Putty) was filled into the defect and condensed. After approximating the flaps with simple interrupted sutures, periodontal dressing was given.

All patients were prescribed antibiotics, analgesics, and Chlorhexidine gluconate mouthwash. Postoperative instructions were given to the patients. After 10 days post-surgery periodontal dressings and sutures were removed, and twice daily rinse of chlorhexidine was advised for 3 weeks. All patients were recalled at 3 and 6 months post-surgery to record the clinical parameters. A radiographic assessment was done 6 months postsurgery.

The data obtained were subjected to statistical analysis using Statistical Package for the Social Sciences (SPSS) software version 23.0 (SPSS Inc., Chicago, IL, USA). The data for each patient was analyzed for difference by using one way analysis of variance (ANOVA). Intragroup comparison was done by Tukey's *Post-hoc* test and intergroup comparison was performed by independent sample *t*-test. The $p < 0.05$ was considered statistically significant.

Results

In group I, the mean PPD at 0, 3, and 6 months was 4.90 ± 1.14 mm, 3.23 ± 0.40 mm, and 2.86 ± 0.20 mm, respectively. When the mean PPD was compared using ANOVA, the resulting difference was highly significant (HS) ($p = 0.001$). Intragroup comparison using Tukey's *post-hoc* test showed a change of 1.67 ± 0.74 mm from 0 to 3 months and 2.86 ± 0.94 mm from 0 to 6 months, respectively, which was observed to be HS ($p = 0.001$). The values at 3 and 6 months showed no difference ($p = 0.107$). The mean PPD at baseline, 3 and 6 months for group II was 4.92 ± 0.76 mm, 3.30 ± 0.54 mm and 3.19 ± 0.22 mm, respectively. When the mean PPD was compared using ANOVA, the variation was HS ($p = 0.001$) (Table 1). Intragroup comparison using Tukey's *post-hoc* test showed a change of 1.62 ± 0.22 mm and 1.73 ± 0.54 mm from 0 to 3 months and 0–6 months respectively, which was found to be HS ($p = 0.001$). When 3 and 6 months scores were related, *p*-value of 0.715 was arrived at (Table 2). Independent sample *t* test showed a significant reduction in PPD



Figs 1A to D: (A) RHAL measured using Naber's probe preoperatively; (B) NB putty being carried to the defect; (C) Defect grafted with NB putty; (D) Measuring RHAL using Naber's probe post-operatively

Table 1: Comparison of PPD, RVAL, and RHAL between group I (DFDBA) and group II (NB putty) at different time intervals

	Group I			*Group II*			*Intergroup*		
	PPD			*PPD*			*PPD*		
Time interval	*Mean ± S.D.*	*F value*	*p-value*	*Mean ± S.D.*	*F value*	*p-value*	*Mean Difference*	*t value*	*p-value*
Baseline	4.90 ± 1.14			4.92 ± 0.76			0.0222	0.13	0.895 (N.S.)
After 3 months	3.23 ± 0.04	66.18	0.001 (H.S.)	3.30 ± 0.54	90.108	0.001 (H.S.)	0.07	0.00	1.00 (N.S.)
After 6 months	2.86 ± 0.20			3.19 ± 0.22			0.33	2.158	0.035 (H.S.)
	RVAL			*RVAL*			*RVAL*		
Time interval	*Mean ± S.D.*	*F value*	*p-value*	*Mean ± S.D.*	*F value*	*p-value*	*Mean Difference*	*t value*	*p-value*
Baseline	6.66 ± 1.28			6.56 ± 1.44			0.10	1.10	1.00 (N.S.)
After 3 months	4.80 ± 1.13	38.216	0.001 (H.S.)	4.80 ± 1.14	20.563	0.001 (H.S.)	0.01	1.00	1.00 (N.S.)
After 6 months	4.36 ± 0.46			4.80 ± 1.33			0.54	0.724	0.425 (N.S.)
	RHAL			*RHAL*			*RHAL*		
Time interval	*Mean ± S.D.*	*F value*	*p-value*	*Mean ± S.D.*	*F value*	*p-value*	*Mean Difference*	*t value*	*p-value*
Baseline	7.65 ± 1.48			7.62 ± 1.82			0.03	0.273	0.786 (N.S.)
After 3 months	5.46 ± 1.34	39.621	0.001 (H.S.)	5.52 ± 1.62	41.181	0.001 (H.S.)	0.06	0.207	0.837 (N.S.)
After 6 months	4.87 ± 1.12			4.70 ± 1.02			0.17	0.555	0.581 (N.S.)

between the groups at 6 months (Table 1), group I showing a greater reduction in PPD.

In group I, mean RVAL values changed from 6.66 ± 1.28 at baseline to 4.80 ± 1.13 at 3 months and 4.36 ± 0.46 at 6 months. When mean RVAL was compared using ANOVA, the variation found was HS ($p = 0.001$) (Table 1). Intragroup comparison using Tukey's *post-hoc* test showed a change of 1.86 ± 0.15 mm and 2.30 ± 0.82 mm from 0 to 3 months and 6 months respectively, showing $p = 0.001$. However, mean reduction in RVAL from 3 to 6 months interval was 0.54 ± 0.67 mm which was non-significant ($p = 0.137$) (Table 2). In group II, mean RVAL values changed from 6.56 ± 1.44 at baseline to 4.80 ± 1.14 at 3 months and 4.80 ± 1.33 at 6 months. When mean RVAL was compared using ANOVA, *p*-value of 0.001 was arrived at between the study intervals (Table 1). Intragroup comparison using Tukey's *post-hoc* test showed a change of 1.76 ± 0.30 mm and 2.76 ± 0.11 mm when baseline values were compared

Table 2: Intragroup comparison of PPD, RVAL, and RHAL in the 2 groups between Baseline and 3 months, Baseline and 6 months and between 3 and 6 months

Parameter	*Group*	*Time interval*	*Mean difference (mm)*	*p-value*
PPD	Group I	0-3 Months	1.67 ± 0.74	0.001 HS
	Group II		1.62 ± 0.22	0.001 HS
RVAL	Group I		1.86 ± 0.15	0.001 HS
	Group II		1.76 ± 0.30	0.001 HS
RHAL	Group I		2.19 ± 0.14	0.001 HS
	Group II		2.10 ± 0.20	0.001 HS
PPD	Group I	0-6 Months	2.86 ± 0.94	0.001 HS
	Group II		1.73 ± 0.54	0.001 HS
RVAL	Group I		2.30 ± 0.82	0.001 HS
	Group II		2.76 ± 0.11	0.001 HS
RHAL	Group I		2.78 ± 0.36	0.001 HS
	Group II		2.92 ± 0.80	0.001 HS
PPD	Group I	3–6 Months	0.37 ± 0.20	0.107 NS
	Group II		0.11 ± 0.32	0.715 NS
RVAL	Group I		0.54 ± 0.67	0.137 NS
	Group II		0.00 ± 0.19	0.696 NS
RHAL	Group I		0.59 ± 0.22	0.716 NS
	Group II		0.82 ± 0.60	0.810 NS

to 3 and 6 months respectively which was found to be statistically HS ($p = 0.001$). However, mean reduction in RVAL from 3 to 6 months was 0.00 ± 0.19 mm which was found to be statistically non-significant ($p = 0.696$) (Table 2). Intragroup comparison of RVAL showed a *p*-value of 1.00 at 0 months, 1.00 at 3 months and 0.425 at 6 months which was found to be non-significant (Table 1).

The mean RHAL at baseline was 7.65 ± 1.48 which reduced to 5.46 ±1.34 at three months and 4.87 ± 1.12 at 6 months in group I, which was found to be HS showing a *p*-value of 0.001 (Table 1). Intragroup comparison using Tukey's *post-hoc* test showed a change of 2.19 ± 0.14 mm and 2.78 ± 0.36 mm when pre-operative values were compared to 3 and 6 months respectively which was found to be HS ($p = 0.001$). However, mean comparison of RHAL from 3 months to 6 months showed a change of 0.59 ± 0.22 mm, which was found to be statistically non-significant ($p = 0.716$) (Table 2). The mean RHAL at baseline, 3 and 6 months for group II was 7.62 ± 1.82, 5.52 ± 1.62 and 4.70 ± 1.02 respectively. When mean RHAL was compared using ANOVA, the difference was found to be HS ($p = 0.001$) (Table 1). Intragroup comparison using Tukey's *post-hoc* test showed a change of 2.10 ± 0.20 mm (0–3 months) and 2.92 ± 0.80 mm (0–6 months), which was found to be HS ($p = 0.001$). However, the mean comparison of RHAL from 3 to 6 months showed a change of 0.82 ± 0.60 mm which was found to be statistically non-significant ($p = 0.608$) (Table 2). Intragroup comparison of RHAL was not significant, showing a *p*-value of 0.786 at baseline, 0.837 at 3 months, and 0.581 at 6 months (Table 1).

In group I, the mean radiographic defect depth was 2.56 ± 0.39 mm at baseline. At 6 months, the mean radiographic defect depth was 0.62 ± 0.25 mm. the difference in depth was 1.94 ± 0.14 mm which was HS ($p = 0.001$) (Table 3). In group II, the mean defect depth as assessed radiographically was found to be 2.43 ± 0.47 mm at 0 months and 0.69 ± 0.15 mm at 6 months. The difference

Table 3: Comparison of radiographic defect depth and radiographic bone density between group I (DFDBA) and group II (NB putty) at different time intervals

	Group I				*Group II*				*Intergroup*		
	Radiographic defect depth				*Radiographic defect depth*				*Radiographic defect depth*		
Time Interval	*Mean ± S.D.*	*Defect Fill*	*t value*	*p-value*	*Mean ± S.D.*	*Defect Fill*	*t value*	*p-value*	*Mean Difference*	*t value*	*p-value*
Baseline	2.56 ± 0.39	1.94 ± 0.14	15.02	0.001 (H.S)	2.43 ± 0.47	1.74 ± 0.32	14.26	0.001 (H.S)	0.13 ± 0.08	0.37	0.79 (N.S.)
After 6 months	0.62 ± 0.25				0.69 ± 0.15				0.07 ± 0.11	1.45	0.17 (N.S)
	Radiographic bone density				*Radiographic bone density*				*Radiographic bone density*		
Time Interval	*Mean ± S.D.*	*Mean Difference*	*t value*	*p-value*	*Mean ± S.D.*	*Mean Difference*	*t value*	*p-value*	*Mean Difference*	*t value*	*p-value*
Baseline	32.42 ± 10.06	48.21 ± 13.47	9.005	0.001 (H.S)	33.25 ± 15.13	47.24 ± 2.16	9.70	0.001 (H.S)	0.83 ± 4.07	0.34	0.90 (NS)
After 6 months	80.63 ± 23.53				80.49 ± 17.29				0.14 ± 6.24	0.062	0.951 (NS)

in depth was 1.74 ± 0.32 mm which was statistically HS ($p = 0.001$) (Table 3). A comparison of the defect depth using an independent sample *t* test was also found to be non-significant when evaluated 6 months postoperatively ($p = 0.17$) (Table 3).

In group I, the mean gray value at the defect was 32.42 ± 10.06 at baseline which changed to 80.63 ± 23.53 at 6 months showing a difference of 48.21 ± 13.47 which was found to be HS ($p = 0.001$) (Table 3). In group II, the mean gray value at the defect was 33.25 ± 15.13 at baseline. At 6 months the mean gray value was found to be 80.49 ± 17.29, showing a difference of 47.24 ± 2.16 which was HS ($p = 0.001$) (Table 3). There was no difference in the gray levels between group I and II at baseline and at 6 months postoperatively (Table 3).

Discussion

Grade I furcations are usually managed with routine periodontal procedures, while grade III furcations have to be treated using more comprehensive therapy, such as tunneling, root amputation, hemisection or extraction. Grade II furcations have confounded clinicians for many years.[14–16] Various techniques have been proposed and advanced to treat mandibular grade II furcation involvement defects.

Demineralized freeze driedbone graft has been used in periodontal therapy for more than 2 decades.[17] Demineralized freeze-dried bone allograft provides an osteoconductive surface besides being a source of osteoinductive material.[7] The effect of DFDBA following its placement results in a series of episodes resulting in the migration of cells, differentiation and bone synthesis. Though the origin of the progenitor cells is not specified, they are attributed to bone morphogenic proteins (BMPs) present within DFDBA.[18]

Incompatible results have been found with respect to the ideal particle size of the graft material to be implanted into the surgical site, including DFDBA. When DFDBA is used in particulate form, particle size also appears to be an important variable in the success of DFDBA as a bone-inductive material. Particles in the range of 125–1,000 microns possess a superior osteogenic potential than do particles below 125 microns.[19]

Bioactive glass bone graft materials are one of the most extensively used alloplastic bone graft materials. Bioactive glass ceramics have indicated biocompatibility resulting in direct contact with bone.[20] When Bioactive glass comes into contact with body fluids, a distinctive surface reaction occurs within a few minutes. After the ionic exchange between the tissue fluid and the material, silanol groups (SiOH) are formed. This SiOH groups bonds with adjacent silanol groups by polycondensation reaction, forming a silicon rich gel layer on the particle surface. This silica plays a key role in developing the bone bonding of bioactive glass.[21]

Novabone dental putty is a unique, next-generation calcium phosphosilicate generated from a bioactive glass platform with added ingredients like poly-ethylene glycol and glycerine to augment handling and efficacy.[22] Novabone putty has a transient hemostatic effect, providing a comfortable environment for the clinician to work with. It encourages clot stabilization and promotes healing. NB putty has no risk of an immunogenic response or disease transmission possibility. Contrary to other synthetic grafts, which are bioinert, NB has both osteoconductive and osteostimulatory effects. Putty resorbs completely and becomes a part of the natural bone remodeling process to yield healthy, vascularized normal bone.[23]

Till date, there is limited literature available on the use of this Bioactive glass for the treatment of class II furcation defects, which captivated us to study this material.

As there is large scale literature available reporting favorable results of bone replacement grafts as compared to non-grafted sites, our study excluded the latter as a control.

The most important outcome of a periodontal procedure is to minimize or eliminate the PPD levels because it directly assists the clinician in maintaining the treated sites.[24]

Significant reduction of PPD was found when comparing baseline (0) values to 6 months post treatment results in DFDBA and NB putty groups, however, DFDBA group showed a greater reduction in PPD compared to NB putty group in the current study. Our results were similar to those of Wallace SC et al.[25] who found significant change in probing depth using DFDBA with expanded polytetraflouroethylene (ePTFE) and ePTFE alone. Our study also correlated with the study of Anderegg et al.[26] who observed reductions in probing depth of 3.27 mm at 6 months with bioactive glass particulate bone replacement graft in mandibular Grade II furcation defects. Contrary to our study, Guillemin et al.[27] reported no change in probing levels when DFDBA was used alone and in combination with membrane. Reduced inflammation, shrinkage of the periodontal pocket wall and gain in attachment level are the factors ascribed to be the primary reason for reducing the PPD.

Change in attachment level following regenerative therapy is the single most used outcome variable in regenerative studies. Tonetti et al observed both gains in clinical attachment level (CAL) and bone height in their study.[28] For outcomes relating to clinical regeneration of furcation treated sites Yukna and Yukna[15] and Eickholz P et al.,[29] reported that it is necessary to measure attachment gain both vertically and horizontally.

In our study, both group I (DFDBA) and group II (NB Putty) have resulted in significant gains in RVAL when 6 months values were compared to baseline. However, intergroup comparison was found to be non-significant. This is in agreement with the study by De Leonardis et al.[2] who used guided tissue regeneration (GTR) solitarily and in combination with DFDBA. Our study also correlated with the study of Anderegg et al.[30] who found significant gain in vertical attachment levels of 3.1 mm and 1.4 mm using PTFE, and DFDBA and ePTFE alone, respectively, however, there was no difference between the groups when evaluated 12 months postoperatively.

Our study resulted in significant gain in relative horizontal attachment levels of 2.60 ± 0.15 mm and 2.866 ± 0.35 mm at six months in group I (DFDBA) and group II (NB putty) respectively. However, the intergroup comparison showed no difference. Using barrier alone and barrier with DFDBA, Luepke et al.[31] found decrease in horizontal furcation depth of 1.13 ± 1.08 and 1.70 ± 1.22 at 6 months respectively.

No substantial information exists on the fate of the DFDBA matrix or on the effect of residual particles within the grafted sites. Different wound healing models indicate that residual DFDBA particles remain within the grafted sites for an extended period of time.[32,33]

Mark A. Reynolds and Gerard M. Bowers in their study concluded that the most encouraging regenerative responses were those related with the amalgamation of the DFDBA graft particles within the newly forming bone.[34] The authors concluded that inflammation and graft containment appear to be important factors influencing the fate of DFDBA and the regenerative responses.

Manifold of possible explanations could account for the wide diversity in reported clinical results using DFDBA. One potential cause might be that bone induction proteins are not present in sufficient quantity to propagate detectable bone formation. Another possibility is that the bone-inductive components of DFDBA are present but in an inactive form.[35,36]

Yukna et al.[37] from their study using bioactive glass bone replacement graft material and ePTFE barrier material revealed that both treatments gained about 0.3–0.4 mm of vertical clinical probing attachment level and 1.3–1.5 mm of horizontal clinical probing attachment level. Complete closure of the furcation could not be achieved in any of the sites in our study, which can be compared to the inconsistency of complete furcation closure by Becker et al.,[38] Machtei and Schallhorn[14] and Evans et al.[39]

Defect fill is a desirable outcome of any periodontal regenerative therapy. To record the changes in the bone levels at the surgically treated sites, digitalized radiographs were taken at 0 and 6 months by a single radiographer using standardized protocols. To detect bone changes, the radiographic analysis used was to measure the linear defect depth reduction and bone density in mean Gray scale level.

Radiographic furcation parameters assessed as linear distances may be used to predict horizontal attachment gain in class II furcation defects, according to Horwitz et al.[3] Both groups showed a reduction in defect depth at baseline and 6 months in the current study.

Radiographic density as measured in Gray scale units showed a definitive difference when baseline values were compared to 6 months postoperatively in both the groups. However, there was no difference in the bone density between the groups. The current study suggests that reduced inflammation and graft containment appear to be the important factors for the success of regenerative materials. From the above study, it can be inferred that both treatment modalities improved clinical and radiographic parameters between baseline and 3 months and 6 months postoperatively.

Conclusion

The above study was instituted to evaluate and compare the efficacy of NB putty and DFDBA in mandibular grade II furcation defects.

The treatment of mandibular grade II furcation defects using NB putty and DFDBA showed significant improvement in PPD and clinical attachment gain. However, there was no significant difference in RVAL, and RHAL between the groups.

As both the groups showed an increase in defect fill and bone density, it can be summarized that NB putty seems to have comparable regenerative properties to that of DFDBA when used for the treatment of mandibular grade II furcation defects and it could be a material of great choice in the future.

Putty consistency of novabone makes it easier and more convenient to use, minimizing graft waste and reducing chairside time, in addition to eliminating any kind of preliminary preparation.

As NB putty can be stored at room temperature, and does not require refrigeration, and has an extended shelf life of 4 years, it might be considered as a predictable regenerative material for the treatment of grade II furcations.

A large sample size could have demonstrated a difference in the results between the 2 grafting groups. Although the findings of this study seem encouraging, there's a need for the same to be shared by investigators on a larger scale with a substantial number of defects.

Limitations

- Limited sample size.
- This study assessed the parameters clinically and radiographically. Surgical re-entry could have provided direct evidence of bone regeneration, but it was decided not to do so due to ethical concerns.
- Use of more advanced techniques like cone beam computed tomography (CBCT) could have yielded better results in radiographic assessment.

Clinical Significance

Although, NB putty is known for its osteostimulative property, encouraging proliferation of new bone cells at the site, resulting in enhanced bone regeneration, and concomitantly increasing the faster resorption rate of graft material, our current study showed no advantage with respect to NB putty in comparison with DFDBA.

The treatment results are easier to assess and evaluate in mandibular molars due to the presence of a single furcation. Implementation of these results for maxillary molar furcation defects may not be totally valid due to anatomical differences. A similar study in maxillary furcation defects would address this issue.

Treatment of a molar with grade II furcation involvement ultimately improves its functional environment without sacrificing its root or bone.

Ease of use and higher-level biologic performance of second-generation bioactive glass putty make it an ideal graft material.

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