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Clinical Evaluation of Regenerative Potential of Xenogenic Bone Grafts in The Treatment of Periodontal Intrabony Defects.

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ABSTRACT

Background: The primary goal of periodontal therapy is to restore the tooth supporting tissues lost due to periodontal disease. The aim of the present study was to evaluate the efficacy of xenogenic bone graft with open flap debridement (OFD) in treatment of periodontal intrabony defects. **Methods**: Twenty intrabony defects were surgically treated. The defects were randomly assigned to treatment with OFD + bone graft (Group B) or OFD alone (Group A). The clinical efficacy of two treatment modalities was evaluated at 9months postoperatively clinically and radiographically. **Results**: Statistically significant intra group improvements were seen with all the hard tissue and soft tissue parameters in both test and control groups. Statistically significant improvements were seen in group B with clinical parameters and the mean defect fill (AC-BOD) when intergroup comparisons were made. **Conclusion**: Treatment with bone graft + OFD led to a significantly more favorable clinical outcome in intrabony defects as compared to OFD alone.

Keywords: Intrabony defects, Open flap debridement, Xenogenic bone grafts.

INTRODUCTION

Periodontitis is an infectious disease affecting the supporting structures of the teeth and may ultimately result in the loss of teeth. During destructive periodontal disease, the connective tissue attachment of the tooth is destroyed leading to pocket formation and concomitantly, alveolar bone resorption. An elusive goal of the periodontal therapy is complete regeneration of the functional attachment apparatus and currently the major progress is being made to achieve this end by utilising various regenerative procedures such as bone grafting, GTR techniques and combination therapy.[1,2]

Xenografts used in the treatment of infrabony defects can be both bovine bone and natural coral, these are also referred to as an anorganic bone, since proprietary processes are suggested to remove all cells and proteinaceous material, leaving behind an inert absorbable bone scaffolding upon which revascularization, osteoblast migration, and woven bone formation supposedly occur.

The purpose of this study was to evaluate and compare regenerative potential of Xenogenic bone graft (Osseograft®) with access flap alone in treatment of periodontal intrabony defects.

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MATERIALS AND METHODS

The present randomized, controlled clinical trial was conducted for period of 9 months compromising of 20 patients {11 males and 9 females, (with age range: 35-50)}, randomly divided into 2 groups and were treated with OFD (group A) and bone graft (osseograft DMBM-xenograft) +OFD (group B). Each patient contributed one defect per site. The participants enrolled for the study were informed verbally, and written consent was obtained before the start of the trial. Inclusion criteria: systemically healthy patients diagnosed with chronic periodontitis based on the international workshop for the classification of periodontal disease,[3] having ≥20 teeth and ≥30% of sites with >4 mm clinical attachment loss (CAL), probing depth (PD) ≥5 mm, and presence of intrabony defect (IBD) ≥3 mm (measured from alveolar crest to the base of the defect on intraoral periapical radiograph). Exclusion criteria were

patients with use of tobacco or tobacco-related products; systemic or local application of antibiotics within the previous 6 months; patients with poor oral hygiene (plaque index (PI) ≥3) after the revaluation of cause-related therapy.

Nonsurgical Periodontal Therapy (Phase 1 therapy): At the baseline all the patients received oral hygiene instructions and non surgical periodontal therapy.

Randomization: Allotment of participants within the groups was performed randomly through the flip of a coin. The treatment allocation of the patients was thus prepared and sealed in the numbered opaque envelopes and were opened during surgery immediately after completing the defect debridement. All the surgical procedures in two groups were performed by a trained periodontist. The pre and postoperative assessments were performed by another examiner (RS) without knowledge of the nature of intervention.

Clinical Parameters: Plaque scores were assessed using Silness and Loe[4] and gingival condition was assessed with the help of Loe and Silness.[5] Probing depth (PD) was measured as the distance from gingival margin to the base of the pocket. An occlusal stent was prepared with cold cure acrylic resin and a groove was made on the stent in relation to each selected tooth to guide the probe position.[6] Relative attachment level (RAL) was measured from apical border of the stent to the base of the pocket. All measurements were recorded to the nearest millimetre using University of North Carolina no. 15 (UNC-15, Hu-Friedy, Chicago, IL, USA) periodontal probe.

Radiographic Assessment: Intraoral periapical (IOPA) radiographs were obtained by long cone paralleling technique to obtain standardized radiographs at baseline and 9 months postsurgery. The anatomical landmarks of the defects were selected based on the criteria set by Schei et al.[7] which include CEJ, alveolar crest (AC), and base of the defect (BOD). For measurement of bone defect, distance from the crest of the alveolar bone to the base of the defect (AC-BOD) was considered.

Materials used in the study

Osseograft®: Osseograft® demineralized bone matrix (DMBM) is a bio-resorbable xenograft composed of type -I collagen which is used for regeneration of osseous defects in periodontal as well as oral and maxillofacial surgeries.

Surgical therapy

Local anesthesia (2% lidocaine with 1:80000 adrenaline) was administered and bone sounding was done to identify the extension of the defect. Intrasulcuar incisions were given buccally and lingually involving one tooth mesial and distal to the intrabony defect and mucoperiosteal flaps were reflected. Vertical incisions were avoided. After performing meticulous defect debridement, direct measurement of the osseous defect was obtained with UNC-15 periodontal probe.

Preparation and application of Osseograft®

The required quantity of the bone graft material was transferred from the vial to the dappen dish and mixed with normal saline. When it became a cohesive mass, it was delivered in small increments into the defect, in intrabony defects of group B taking care not to overfill it.

The mucoperiosteal flaps were repositioned and secured in place by interrupted suture using the black braided (4-0) silk. The surgical area was protected and covered with non-eugenol dressing (Coe-Pack®, G C America Inc, USA).

Post Operative Care

All patients were prescribed systemic antibiotic (Amoxicillin 500 mg) for 5 days and Diclofenac sodium 50 mg thrice daily for three days. All the patients were instructed to use 0.2% chlorhexidine rinses twice daily for 2 weeks. After one week following surgery, the periodontal dressing and sutures were removed and the area was irrigated thoroughly with saline. At this visit, oral hygiene instructions were reinforced. Patients were evaluated clinically and radiographically at nine months, postoperatively and scaling was done if necessary.

Statistical Analysis:

The data was analyzed using statistical software SPSS (version 20.0) and Microsoft Excel (version 5.00). The results were averaged (mean standard deviation) for each clinical and radiographical parameter at baseline and 9 months. Inter group analysis of data was done by applying Student‘s independent t-test (also known as unpaired t-test) and for intra group analysis, Paired t-test was employed. A p value of less than 0.05 was considered statistically significant.

RESULTS

All participants were followed up for a period of 9 months. Postoperative healing of all the control and test sites was uneventful. Participant's gender, defect characteristics, and location are presented in [Table 1].

Table 1: Number, gender, osseous defect morphology, and defect location

Parameters	Group A (OFD only)	Group B (OFD + Osseograft)
No. Of patients (sites)	10	10
Gender (M/F)	6/4	5/5
Defect location(maxilla/mandible)	5/5	6/4
Osseous defect 2/3	2/8	1/9

Clinical Parameters

A statistically significant reduction in the PI and GI [Table 2] and pocket depth (PD) [Table 2] was seen in both the groups at 9 months postoperatively($p<0.05$). Mean reduction in PD was higher in group B compared to group A, the results were statistically significant. Both the groups revealed significant ($p<0.05$) gain in the RAL [Table 2]. Intergroup comparison showed a significant gain in RAL in group B compared to group A

Table 2: PI scores, GI scores, PD and RAL in groups (A and B) at baseline and 9 months

Parameters	Group A (OFD only)		Group B (OFD +osseograft)	
	Mean ± SD	P value	Mean ± SD	P value
Plaque index				
Baseline	2.15±.45603	.000001	2.12±.36148	<.001
9 months	1.23±.23244		.80± .43589	
Gingival index				
Baseline	1.824±.563	<.0001	1.98±.48211	.00001
9 months	1.067±.31651		.4215±.10424	
Pocket depth				
Baseline	5.20±1.032	<.001	5.10±.87560	.000001
9 months	3.10±.73786		2.1±.3162	
Relative attachment level				
Baseline	10.6±.699	.000002	10.5±.966	<.001
9 months	8.4±.5164		7.5±.67495	

Radiographic Parameters

Both the groups showed a significant reduction in Defect depth (AC-BOD) at 9 months postoperatively ($P < 0.05$). Inter-group analysis revealed a statistically significant ($P < 0.05$) mean Defect depth reduction in group B compared to group A.[Table 3]

Table 3: Radiographic defect depth over 9 month period

Parameter	Group A (OFD only)		Group B (OFD +osseograft)	
	Mean ± SD	P value	Mean ± SD	P value
Defect depth(DD) Alveolar crest (ac) – base of defect (bod)				
Baseline	3.75± .353	.000001	3.83±.23594	<.0001
9 months	2.95±.347		2.13±.28304	

Table 4: shows the mean changes in clinical and radiographic defect depth over period of 9 months.

Parameters	Group A (OFD only)	Group B (OFD +osseograft)
Mean pd change	2.1±.1795	3.0 ±.816
Mean RAL gain	2.2 ±.632	2.9 ±.737
Mean dd reduction	.800 ±.226	1.7±.377

DISCUSSION

The ultimate goal of periodontal therapy is to provide a dentition that functions in health and comfort for the life of the patient. A shortcoming of currently available modalities of periodontal regeneration is the limited predictability. Even though various regenerative procedures like GTR, osseous grafting or the combination of both, have been shown to be effective in promoting clinical, radiographical, and histologic periodontal regeneration, complete restoration of the attachment apparatus in every treated defect is still a distant dream. The present study was designed to evaluate the regenerative potential of bone graft with the open flap debridement (OFD) in the treatment of periodontal intrabony defect. The selection of regenerative material and technique in the present study was based on some evidence[8] and clinical experience. The bone graft material (Osseograft®) acts as a filler material in defect. It acts as a bone substitute that promotes the formation of native bone as they function as bioabsorbable matrix for healing while encouraging new bone formation by osteoconductive/ osteinductive bioactivity. It also acts as a framework into which bone forming cells and blood vessels integrate leading to the formation of healthy new bone and subsequent repair of the osseous defect.

Mostly three wall intrabony defects were included in the present study because bone regeneration is believed to be improved with increasing number of bony walls facing the root surface. The three wall defect allows better containment and increased blood supply to the graft.[9] The clinical outcome measures for determining the effect of therapy on the anatomical defects produced by periodontal diseases are probing pocket depth and CAL and both these treatment measures are considered as the widely accepted therapeutic end point after periodontal regenerative therapy. Present study demonstrated positive clinical outcome (for example, reduction in probing pocket depth and gain in RAL). The results obtained are comparable with those of previous studies by Richardson et al.10and Raouf Hanna et al.[11]

Radiographic monitoring of alveolar bone changes following regenerative procedures is a non invasive, painless alternative to direct bone measurements; regeneration in periodontal defects is usually measured by BF in angular defects.[12] In the present study, significant reduction in defect depth was seen in the test group than in the control group when the bone level was compared radiographically from baseline to 9 months, postoperatively. This observation was in agreement with the previous studies by Chen et al,[13] and Wang et al.[14]

As we did not perform a histological evaluation to assess what the newly formed tissues were, in regard to the clinical gains in the present study, one might assume that the graft particles could have been merely a scaffold for connective tissue ingrowth. Similarly, although it has been stated that pocket depth decreased during the study, the absences of bone could still be present. This idea cannot be rejected until a histologic study is performed. Therefore, to verify the results obtained from the current research, it would be important to have a histologic biopsy with a pretreatment landmark.

CONCLUSION

In conclusion, the finding of this study indicated that the use of xenogenic bone graft material was beneficial for the treatment of periodontal intrabony defects. However further studies with larger sample size, histologic biopsy with pretreatment landmark and longer follow-ups are required.

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