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AutoBT: A new Paradigm in Periodontal regeneration

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Abstract:

Background: Autogenous bone is an ideal material for the reconstruction of hard tissue defects, because it promotes osteogenesis, osteo-induction and osteo-conduction. The use of AutoBT, a novel bone grafting material produced from autogenous teeth, resulted in excellent bone healing based on an analysis of its inorganic components, surface structure and histologic evidence of the healing process. **Materials & Methods:** Ten sites were included using the following inclusion criteria. **Inclusion criteria:** One or more sites showing intra-bony defect with probing pocket depth (PPD) ≥ 5mm, clinical attachment loss of ≥ 3mm, 2 or 3 wall intra-bony defects with radiographic defect of size ≥ 3 mm & in same patient mobile teeth indicated for extraction. In test group, among 5 sites, regenerative treatment was performed using tooth as autograft along with chorion membrane & in control group, 5 sites were treated with demineralized freeze-dried bone allograft (DFDBA) with chorion membrane. Clinical parameters such PPD, CAL were evaluated at baseline, 3 & 6 months & radiographic parameters at baseline & after 6 months of treatment. **Results**: The patients treated by tooth as autoBT material with chorion membrane showed non- significant results to DFDBA with chorion membrane in intra-bony defects in all the clinical parameters. So AutoBT can be used as a useful alternative to DFDBA in periodontal regenerative therapy for intra-bony defects.

Key words: Auto BT, Periodontal, osteoconductivity, autograft

Introduction:

Reconstruction of lost tissues is a major goal of periodontal therapy. Bone substitutes are actively used as a treatment modality to regenerate or reconstruct bony defects. There are four categories of bone graft materials, viz. autograft, allograft, alloplast and xenograft. Various new bone graft materials have been introduced in the last two decades. These graft materials contribute new bone formation through osteogenic or osteo-inductive or osteo-conductive mechanisms.[1] It is widely accepted that autografts are known to be gold standard as it possesses the properties of osteoconductivity, osteoinductivity and osteogenecity. However, autogenous bone grafts harvested from extra-oral sites have some limitations namely morbidity, potential resorption and high cost with advancements in tissue engineering [2.] The auto tooth graft material was obtained from patients extracted teeth. It was first introduced by the Korean tooth bank R and D center and has satisfied many clinicians and patients for its osteo-conduction as well as osteo-induction capacity.[3] Many researchers have extensively studied compensating the drawbacks of autografts which lead to the attention to human tooth as a substitute due to its high similarities with the bone. It is also observed that tooth has much lower fat content and no marrow compared to bone, which make it easier to be changed into graft material. Autotooth bone graft materials are divided into block and powder types. The powder type is supplied based on various sizes of particles, porosity between powders, and blood wettability, osteo-conduction, osteo-induction, and creeping substitution abilities.[2] With above data, autotooth bone graft material is very useful in clinical situations because it supports excellent bone regeneration through osteo-induction and osteo-conduction capacity and minimizes

foreign body reaction due to genetic homogeneity. Hence, the aim of the present study is to evaluate and compare autograft obtained from tooth with chorion membrane versus demineralized freeze-dried bone allograft with chorion membrane in intra-bony defects.

Materials and Methods:

Ten sites were included under following criteria; Inclusion criteria- sites showing intra-bony defect with probing pocket depth of ≥ 5mm, clinical attachment loss of ≥3mm, 2 or 3 wall intra-bony defects with radiographic defect of size ≥ 3 mm and in same patient mobile teeth indicated for extraction. Exclusion criteria- Known systemic illness &/ drug therapy that would interfere with wound healing, Pregnancy/ lactation, smoking (or tobacco use in any other form), unacceptable oral hygiene after re-evaluation of phase I therapy. In test group, among 5 sites, regenerative treatment was performed using tooth as autograft along with chorion membrane and in control group, 5 sites were treated with DFDBA with chorion membrane. Clinical parameters such as probing pocket depth, clinical attachment level were evaluated at baseline, 3 & 6 months of treatment & radiographic parameter of intra-bony defect was evaluated at baseline and after 6 months of treatment (**Figure I -VIII**).

Method of preparation of autotooth bone graft-

Tooth which was indicated for extraction was extracted prior to the periodontal surgery. Extracted teeth were thoroughly cleaned to make it free of debris and any of the attached tissues. Then crown and root portions of the tooth were separated and the root portion was sent to Tata Memorial Hospital and tissue bank for grinding purpose where it underwent dehydration, defatting process and then lyophilized. After sterilization with gamma radiation, the powder was packed and transported to the hospital.

Results: **Table I** shows comparison of clinical parameters- PPD, CAL, which is statistically significant at 3 months and 6 months in both the groups. **Table II** shows that both groups are comparable in both clinical parameters and there is no statistical significant difference on inter-group comparison.

Group	Parameters	At baseline	3months	6months	'P' value
Group 1	PPD	5.4±0.16	4.2±0.2	3±0.25	0.0042
	CAL	5.4±0.16	4.2±0.2	3±0.25	0.0007
Group 2	PPD	5.3±0.3	4.3±0.3	3.3±0.3	0.001
	CAL	5.6±0.2	4.6±0.23	3.5±0.36	0.001

Table I: Intra-group comparison in clinical parameters CAL, PPD at baseline, 3 & 6 months

Table II: showing inter-group comparison of PPD, CAL in Group1 & Group 2

	At 3 months			At 6 months		
	Group 1	Group 2	'P' value	Group 1	Group 2	'P' value
PPD	4.3±0.3	4.2±0.21	0.72	3.3±0.3	3.04±0.25	0.17
CAL	4.6±0.23	4.4±0.21	0.29	3.5±0.36	3.2±0.2	0.19

Table III: showing radiographic bone fill from baseline to 6 months in both groups

	Mean distance from CEJ to base of defect at baseline	Mean distance from CEJ to base of defect at 6months	bone fill	P value
Group 1	3.8 ± 0.4	2 ± 0.3	1.8±0.1	0.4
Group 2	4 ± 0.4	2.1 ± 0.3	1.9±0.1	0.3

Figure I: preoperative -7mm of pocket mesial to 46

Figure II: Pre- operative radiographic view of intra-bony defect mesial to 46

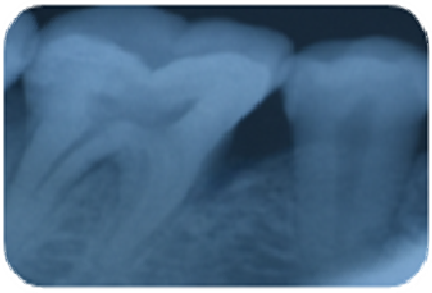


Figure III: Flap reflection

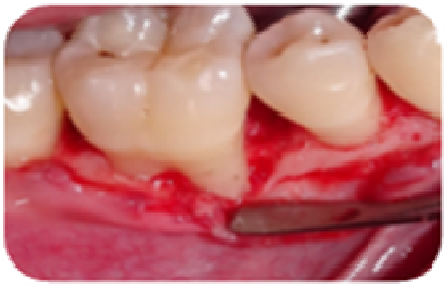


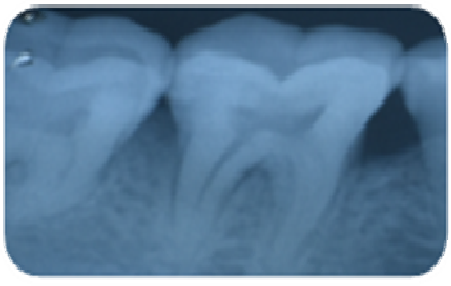
Figure IV: Placement of AutoBT graft in defect

Figure V: Suturing done

Figure VI: Periodontal pack given

Figure VII: Post-operative PPD 3mm at 6 months

Figure VIII: Post-operative radiograph at 6 months



Also, the amount of bone fill in both groups from baseline to 6 months was statistically significant ($p<0.05$). The defect fill at 6 months post surgery was 1.8 ± 0.1 mm and 1.9 ± 0.1mm in group 1 and in group 2 respectively. But on comparing the two groups, there was no statistical difference in mean defect fill.

Discussion:

Many studies reveal that autogenous demineralized dentin matrix are biocompatible and both osteo-conductive, osteo-inductive in nature. Autotooth bone graft material consists of 55% inorganic and 45% organic substances. Among the inorganic substances, hydroxyapatite possesses the characteristics of combining and dissociating calcium and phosphate as those of bone. The organic substances include the bone morphogenic protein (BMP) and proteins with osteo-induction capacity as well as type I collagen, which is the same as alveolar bone itself. [4] In the present study, on intra-group comparison, Group 1 and group 2 sites showed statistical significant results with reference to clinical parameters i.e. reduction in PPD, gain in CAL and radiographic bone fill from baseline to 6 months. The defect fill at 6 months post-surgery was 1.8 ± 0.1 mm and 1.9 ± 0.1mm in group 1 and in group 2 respectively. On inter-group comparison, both groups were comparable. According to case report by Krishna et al, the use of auto tooth as graft material, revealed reduction in PPD from 10 mm to 5 mm and gain in CAL by 3 mm, also significant bone formation at the end of 3 months with additional crestal bone formation followed by almost complete bone fill by 9 months.[5] Kim et al in their study, proved successfully the use of artificially processed tooth as graft material, which was supported by Murata, et al in Japan wherein bone was generated from demineralized tooth on the hypothesis that the components of tooth are similar to those of bone [6]. Kim YK et al in a study, evaluated the clinical application of auto tooth bone graft material and on histological assessment concluded the formation of new bone, densified lamellated bone, trabecular bones and osteoblasts.[7] A study conducted by Kim YK et al concluded that auto block type tooth bone graft can be considered a good alternative bone graft to a synthetic bone graft in a bone-added sinus lift, when extraction is necessary prior to the surgery.[8] Murata M et al first confirmed the osteo-inductive property of human demineralized dentin matrix (DDM) histologically. The DDM induced bone and cartilage independently [9]. A study done by Yung CH et al concluded that auto tooth bone graft material is viable for guided bone regeneration and can yield a stable marginal bone level even after functional loading of implants. The degree of marginal bone loss after loading with auto tooth bone graft material is stable. [10] This is first kind of study where AutoBT is compared with DFDBA along with chorion membrane.

Conclusion:

In the present study, AutoBT and DFDBA with chorion membrane were used in the treatment of intra-bony defects. There was statistical significant reduction in PPD, gain in CAL and bone fill in intra-bony defects in group 1 where AutoBT with chorion membrane was used. In group 2, DFDBA with chorion membrane showed statistical significant reduction in PPD, gain in CAL and bone fill in intra-bony defects. On inter-group comparison, group1 and group 2 were comparable and there was no statistical significant difference. So, AutoBT can be a substitute for DFDBA in regenerative periodontal treatment because being an autograft, chances of immunogenic reactions are absent. Other advantages are its easy

availability, cheap and graft can be prepared as a chair side procedure.

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