ORIGINAL RESEARCH

Evaluation of Regenerative Efficacy of Amnion and Chorion Membrane in Treatment of Mandibular Molar Furcation Defects: A Clinico-radiographic Study

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Abstract

Aim: Amnion and chorion membranes possess unique inherited biological properties that enhance wound healing and may accelerate periodontal regeneration. The present study aims to evaluate and compare the efficacy of amnion and chorion membranes in the treatment of furcation defects.

Materials and methods: A total of 20 patients were selected and were randomly allocated to group I and group II with 10 subjects in each group. Amnion and chorion membranes are placental-derived membranes that accelerate regeneration by having natural growth factors with their antimicrobial and inflammation reduction properties. Group I was treated using bone grafting with decalcified freeze-dried bone allograft (DFDBA) and placement of amnion as a membrane for guided tissue regeneration (GTR) whereas group II was treated using bone grafting with DFDBA and placement of chorion as a membrane for GTR. The patients were followed for clinical and radiographic parameters and were evaluated between 3 and 6 months after surgery.

Result: In intragroup comparison, a significant difference was evident in both the groups for all the clinical and radiographic parameters within the groups. ($p = 0.01$) This means both amnion and chorion membranes showed statistically significant regenerative efficacy. In intergroup comparison, the results show that all the clinical parameters and radiographic parameters show no significant difference between the groups.

Conclusion: The amnion and chorion membranes had similar regenerative efficacy in combination with DFDBA in patients with buccal degree II furcation defects in mandibular molars.

Clinical significance: The amnion and chorion membranes have shown significant improvement in clinical and radiographic parameters when used for the treatment of buccal degree II furcation defects in mandibular molars.

Keywords: Amnion membrane, Chorion membrane, Demineralized freeze-dried bone allograft, Furcation, Periodontal regeneration.

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Introduction

Periodontitis is an inflammatory disease of the supporting structures of the teeth caused by specific microorganisms or groups of specific microorganisms, resulting in progressive destruction of the periodontium.[1] The goal of periodontal therapy is to arrest the progression of disease and to achieve a healthy and functional periodontium that helps in the long-term maintenance of the dentition.[2]

Furcation involvement (FI) is an important complication in the progression of periodontitis and increases the risk of tooth loss in multirooted teeth.[3] The etiology of FI can be one or a combination of bacterial invasion from the surrounding periodontal lesion or a root ward extension of the periodontal pocket combined with the inflammation in the area. The prevalence of FI is 8% in the mandibular molars using the periapical radiographs.[4] Limited accessibility through the furcation entrance area as well as complex anatomy and morphology of mandibular molar teeth pose a challenge in effective instrumentation of furcation defects.[5,6] To address this issue, various techniques such as bone grafts and guided tissue regeneration (GTR) were used. These treatments are used either as monotherapies or in a combination of both.[7]

While bone allografts such as demineralized freeze-dried bone allograft (DFDBA) are known for their bone morphogenetic protein-mediated osteoinductive potential, various cell populations of the periodontium are also proposed to be having regenerative potential.[8] Guided tissue regeneration is selectively guiding such tissue regeneration onto periodontium.[9] Bioabsorbable barrier membranes, in GTR, have largely replaced older nonresorbable membranes which are more prone to infections and delayed wound healing.[10,11]

Placenta-derived bioabsorbable membranes such as amnion and chorion have grabbed unique attention due to their distinct biological property of having natural growth factors in addition to collagen layers rich in type I, IV, V, and VI collagens.[12] Both amnion and chorion membranes possess unique inherited biological properties that enhance wound healing and may accelerate

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regeneration when compared to collagen membranes which have reduced epithelial migration, decreased vascularization, unpredictable degradation profile and risk of disease transmission.[13] These membranes were already in use in general surgery and ophthalmology for epithelial regeneration. In Periodontology, both amnion and chorion membranes have been found to have regenerative efficacy in furcation and intrabony defects and gingival recession coverage.[14,15] However, there is a lack of literature comparing the efficacy of these membranes to each other in the treatment of furcation defects. Comparative data once obtained can help in the usage of the membrane with superior regenerative potential for the treatment of teeth with FI. Hence, this present study was undertaken with the aim to clinically and radiographically compare the regenerative efficacy of amnion and chorion membranes in combination with DFDBA for the treatment of buccal degree II furcation defects in mandibular molars.

Materials and Methods

Study Design and Sample Size Calculation

This study was a double-blind, parallel-arm randomized comparative study. The sample size was calculated using the nMaster 2.0 software. The power of the study was taken to be 80% and a confidence interval (CI) of 95% was taken. The sample size was estimated to be a minimum of 5 per group. It was planned to be conducted on a total sample of a minimum of 20, divided into a minimum of 10 per group. The research was started after obtaining ethical clearance from the Institutional Ethics Committee (Ref No SU/SMS&R/76-A/2019/130).

Inclusion and Exclusion Criteria

The study was conducted on patients who reported to the Outpatient Department during the period from December 2019 to May 2021 (study duration of 1.5 years). Patients who were diagnosed with buccal degree II furcation defects (as per Hamp et al. 1975 classification, defined as horizontal loss of support 3 mm, but not encompassing the total width of the furcation) in their mandibular first and second molars with a vertical probing depth (PPD) ≥5 mm and intraoral periapical radiographs showing radiolucency in the furcation areas of the above teeth were included in the study.

Patients having any systemic diseases or taking medications known to affect periodontal therapy outcomes, pregnant or lactating mothers, patients using tobacco in any form, patients who had undergone periodontal therapy in the last 6 months or with poor oral hygiene [Plaque Index (PI) >1.5, Silness and Loe, 1964] were excluded from the study.

The selected patients were explained the nature and outcome of the study. Verbal and written informed consent were obtained.

Study Groups

A total of 20 patients were selected and allocated by simple randomization of the flip of the coin method to group I and group II with 10 subjects in each group. Group I was treated using bone grafting with DFDBA and placement of amnion as a membrane for GTR. Whereas group II was treated using bone grafting with DFDBA and placement of chorion as a membrane for GTR. The study was performed by 2 clinicians, namely, clinician 1 and clinician 2. Clinician 1 performed the surgical procedures. In the study, clinician 2 recorded the clinical and radiographic parameters and the patients were blinded to the type of membrane received in the furcation area during the treatment. The treatment response was evaluated clinically using parameters such as site-specific PI (Silness and Loe, 1964), site-specific sulcus bleeding index (SBI) (Muhlemann and Sons 1971), PPD, horizontal probing depth (HPD), relative vertical clinical attachment level (RVCAL) and relative horizontal clinical attachment level (RHCAL) (Fig. 1). Cone beam computed tomography (CBCT) was used for measuring the radiographic parameters such as vertical height of furcation (V-HOF), horizontal depth of furcation (H-DOF). Bone fill percentage was calculated. Bone defect fill percentage was calculated by the following formula: H-DOF (baseline)-H-DOF (at 6 months)\V-HOF (baseline)—V-HOF (at 6 months) × 100.

Methodology

Each patient was examined for 5 visits. During the first visit, full mouth supragingival scaling and root planning were done using a piezoelectric ultrasonic scaler. Maxillary and mandibular impressions were taken using alginate and a diagnostic cast was poured in dental stone. The stent was prepared using cold cure acrylic in such a way UNC-15 probe could be aligned in the center of the buccal region of the furcation defect while making measurements. At 4–6 weeks from the first visit, pre-op investigations such as complete blood count (CBC) including platelet count, bleeding time (BT), clotting time (CT), prothrombin time (PT), and international normalized ratio (INR) were done and ensured were within normal limits. The clinical parameters were reassessed, and radiographic parameters are measured using CBCT.

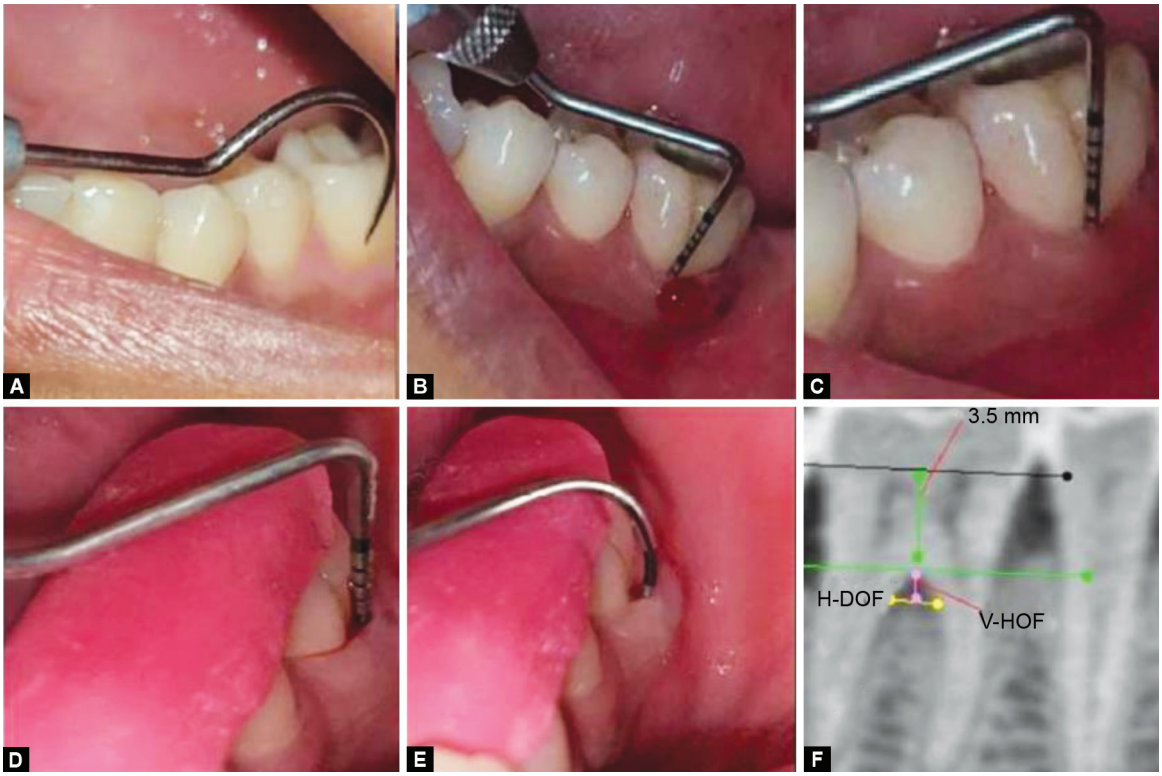
Extra oral antisepsis with povidone-iodine and local anesthesia was administered, following which, intrasulcular incisions were given and a mucoperiosteal flap were raised. The granulation tissue in the furcation defect was removed, and the exposed root surface, including the roof of the furcation, was scaled and planed using hand and ultrasonic instruments. Group I was treated using bone grafting with DFDBA and placement of amnion as a membrane for GTR. Whereas group II was treated using bone grafting with DFDBA and placement of chorion as a membrane for GTR. This was carried out as given below.

Amnion and chorion membranes of size 3 × 3 cm were obtained from Tata Memorial Hospital, Tissue Bank, Mumbai which were cut into small pieces using sterile scissors and placed into the furcation defect of the respective patient using tweezers along with sealed vials DFDBA granules (Tata Bone) of particle size 500–1000 microns, after opening and soaking it in saline solution. The mucoperiosteal flap was re-positioned in place using 3–0 nonabsorbable black silk surgical sutures. The surgical area was protected and covered with periodontal dressing COE-Pack (Fig. 2). Suitable antibiotics and analgesics (500 mg amoxicillin 3 times per day for 5 days and 400 mg ibuprofen 3 times per day for 5 days) were prescribed, along with chlorhexidine di gluconate rinses (0.12%) twice daily for 2 weeks to both the groups.

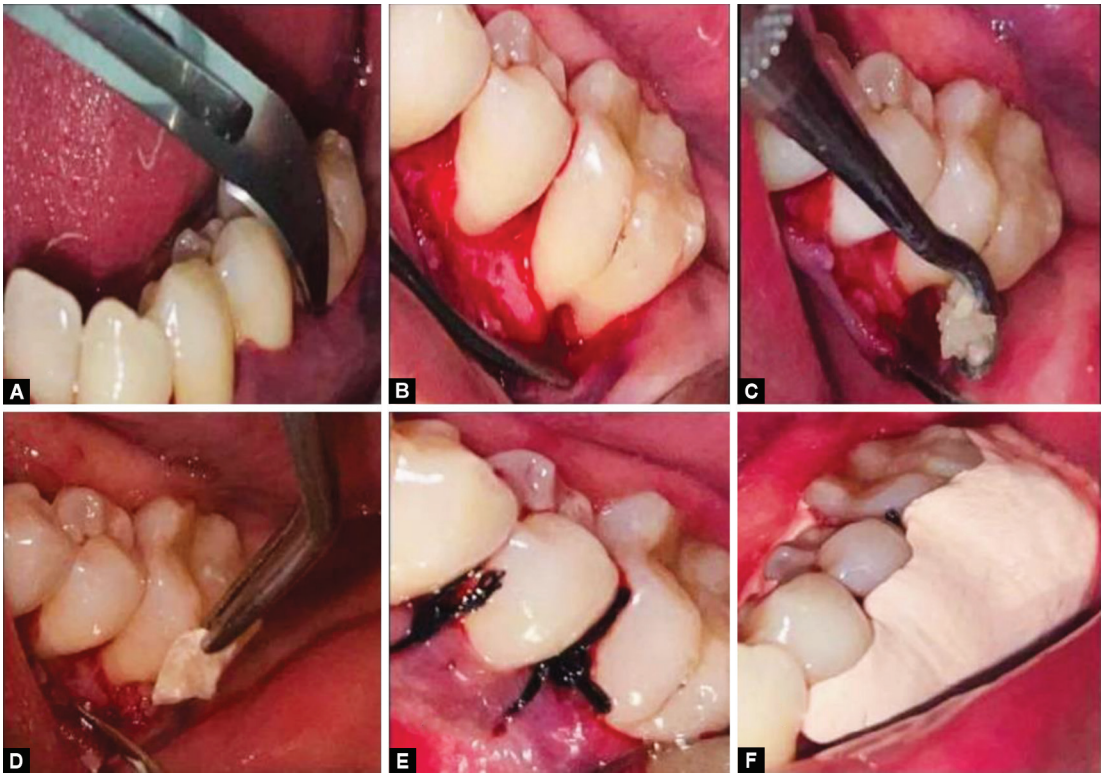
After 7 days surgical therapy, periodontal dressing, and sutures were removed. Surgical wounds were gently cleansed with an antiseptic solution and patients were instructed to brush gently using soft toothbrush, and oral hygiene instructions were also given to both groups. At 3 months, only the clinical parameters are reassessed. At 6 months both clinical and radiographic parameters were recorded.

Statistical Analysis

The data was entered into a master chart and analyzed using SPSS (Statistical Package for Social Sciences) package 26.0 for relevant statistical comparisons, with a level of statistical significance set at *p*-value less than or equal to 0.05. First, the data was described



Figs 1A to F: Recording of clinical and radiographic parameters, (A) Recording of site-specific plaque index; (B) Recording of site-specific sulcus bleeding index; (C) Recording of vertical probing depth; (D) Recording of relative vertical clinical attachment level; (E) Recording of relative horizontal clinical attachment level; (F) Recording of horizontal depth and vertical height of furcation



Figs 2A to F: Surgical procedure, (A) Sulcular incision given using No. 12 blade; (B) Flap elevation and debridement is done; (C) Placement of dried freeze-dried bone allograft; (D) Placement of amnion/chorion membrane; (E) Sutures are placed; (F) Periodontal dressing is given

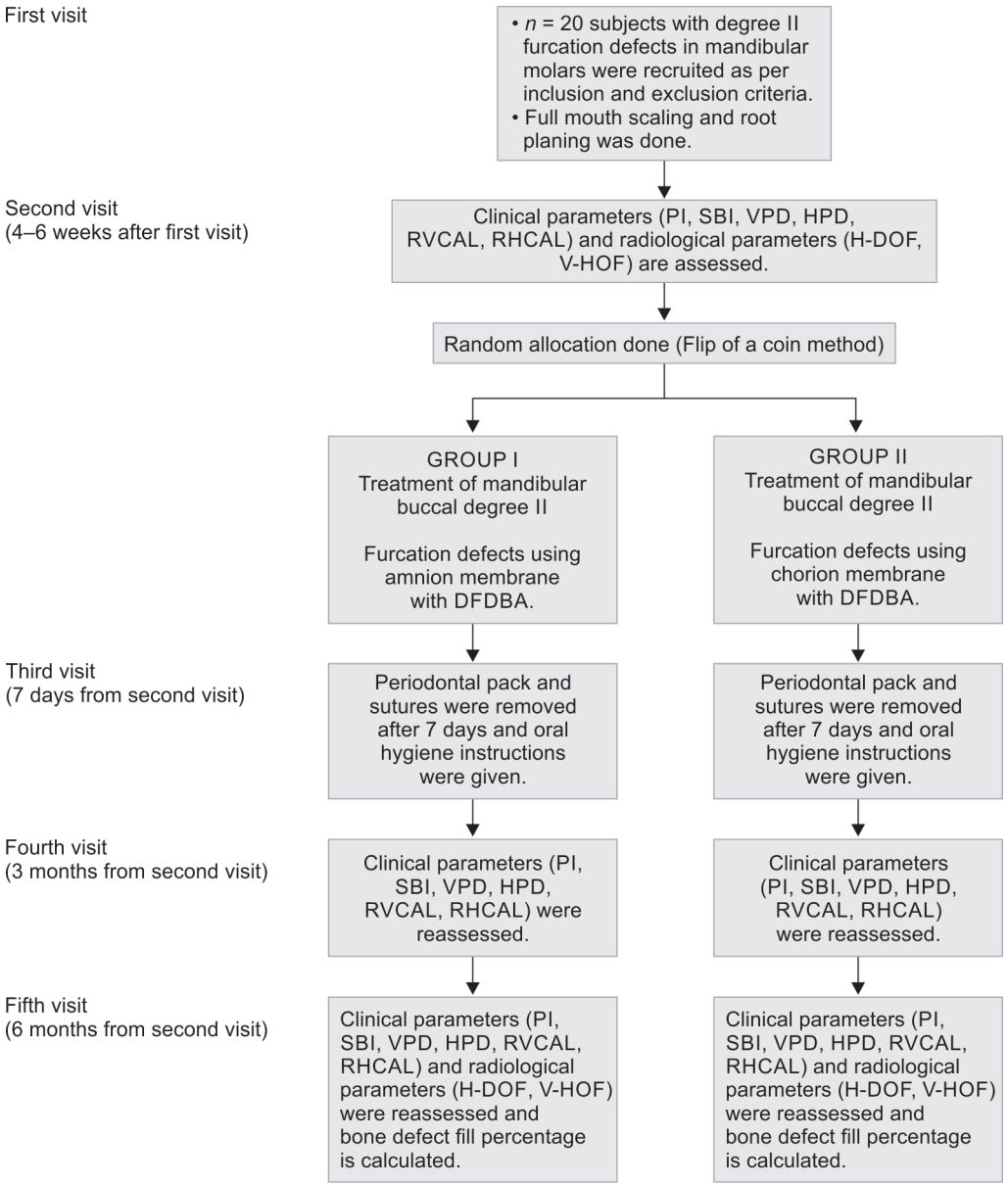


Fig 3: Figure explaining the patient visits and data collection in the study

for distribution in terms of frequencies and percentages of demographic categorical independent variables such as age groups and gender, the clinical categorical independent variable, namely groups of amnion and chorion were also summarized as frequencies and percentages. Descriptive statistics were performed for clinical and radiological parameters, which were continuous variables, by calculating their means and standard deviations. According to the central limit theorem, it was decided to apply parametric tests for inferential statistics irrespective of the distribution of dependent variables. Thereafter, inferential statistics was done using one sample *t*-test and independent sample *t*-tests for intragroup and intergroup comparisons of the clinical and radiological parameters which are continuous variables.

Results

Out of a total of 20 subjects, 9 (45%) of the subjects were females and 11 (55%) were males. In group I, 4 (40%) were females and 6 (60%) were males, whereas in group II, both females and males were 5 (50%) each with the mean age (in years) of group I being 36.10 (±11.75) which was lower compared to 47 (±11.18) of group II. However, there was no statistically significant difference between the groups at baseline (Fig. 3).

In intragroup comparison, both group I and group II showed statistically significant reduction (p-value ≤ 0.05) in clinical parameters at baseline, 3 and 6 months. Clinical parameters such as site-specific PI (group I base line – 1.96 ± 042, 6 months – 0.65 ± 0.27, group II base line – 1.91 ± 0.30, 6 months – 0.70 ± 0.15), site-specific SBI (Group I baseline – 1.4 ± 052, 6 months – 0.7 ± 0.48, group II base line – 1.5 ± 0.53, 6 months – 0.7 ± 0.48), VPD (group I base line – 6.0 ± 082 mm, 6 months – 2.60 ± 0.97 mm, group II base line – 6.30 ± 0.095 mm, 6 months – 3.20 ± 1.14 mm), HPD (group I base line-3.80 ± 0.79 mm, 6 months – 1.50 ± 0.53 mm, group II base line – 3.60 ± 0.84 mm, 6 months – 1.70 ± 0.67 mm), RVCAL (group I base line – 6.90 ± 057 mm, 6 months – 2.70 ± 0.48 mm, group II base line – 6.70 ±

Table 1: Intra-group comparison of clinical parameters of group I and group II

							One Sample t-test			
	Baseline		3 months		6 months		Baseline to 3 months		Baseline to 6 months	
	Mean	SD	Mean	SD	Mean	SD	t-value	p-value	t-value	p-value
PI										
Group I	1.96	0.42	1.23	0.23	0.65	0.27	17.19	0.01*	7.68	0.01*
Group II	1.91	0.30	1.18	0.29	0.70	0.15	12.87	0.01*	14.85	0.01*
SBI										
Group I	1.4	0.52	1.0	0	0.7	0.48	4.58	0.01*	4.58	0.01*
Group II	1.5	0.53	1.0	0	0.7	0.48	4.58	0.01*	4.58	0.01*
VPD										
Group I	1.4	0.52	1.0	0	0.7	0.48	4.58	0.01*	4.58	0.01*
Group II	1.5	0.53	1.0	0	0.7	0.48	4.58	0.01*	4.58	0.01*
HPD										
Group I	3.80	0.79	2.30	0.48	1.50	0.53	15.06	0.01*	14.70	0.01*
Group II	3.60	0.84	2.40	0.52	1.70	0.67	9.00	0.01*	7.96	0.01*
RVCAL										
Group I	6.90	0.57	4.90	0.88	2.70	0.48	17.70	0.01*	11.11	0.01*
Group II	6.70	0.82	4.70	1.34	2.60	0.52	17.68	0.01*	15.92	0.01*
RH-CAL										
Group I	4.10	0.74	2.40	0.70	1.70	0.82	10.85	0.01*	6.53	0.01*
Group II	3.80	0.79	2.70	0.48	1.80	0.79	17.68	0.01*	7.22	0.01*

$p < 0.05$ is considered significant; *t*-value, test value; *p*-value, probability value; HPD, horizontal probing depth; PI, plaque index; RHCAL, relative horizontal clinical attachment level; RVCAL, relative vertical clinical attachment level; SBI, sulcular bleeding index; SD, standard deviation; VPD, vertical probing depth

Table 2: Intra-group comparison of radiographic parameters of group I and group II

					One sample t-test	
	Baseline		6 months		Baseline to 6 months	
	Mean	SD	Mean	SD	t-value	p-value
V-HOF						
Group I	2.43	0.89	1.67	0.71	6.19	0.01*
Group II	1.67	0.85	1.14	0.74	4.86	0.01*
H-DOF						
Group I	2.26	0.81	1.52	0.75	6.43	0.01*
Group II	2.25	0.66	1.71	0.51	10.83	0.01*

$p < 0.05$ is considered significant, *t*-value, test value; *p*-value, probability value; H-DOF, horizontal depth of furcation; SD, standard deviation; V-HOF, vertical height of furcation

0.82 mm, 6 months – 2.60 ± 0.52 mm) and RHCAL (group I base line – 4.10 ± 074 mm, 6 months – 1.70 ± 0.82 mm, group II base line – 3.80 ± 0.79 mm, 6 months – 1.80 ± 0.79 mm) showed significant improvement after treatment in both the groups (Table 1).

For radiographic parameters, in intragroup comparison, both group I and group II showed statistically significant reduction (p-value ≤ 0.05) in radiographic parameter V-HOF (group I base line – 2.43 ± 0.89 mm, 6 months – 1.67 ± 0.71 mm, group II base line – 1.67 ± 0.85 mm, 6 months – 1.14 ± 0.74 mm) and H-DOF (group I base line – 2.26 ± 0.81 mm, 6 months – 1.52 ± 0.75 mm, group II base line – 2.25 ± 0.66 mm, 6 months – 1.71 ± 0.51 mm) at 6 months (Table 2).

In intergroup comparison, group I and II show no significant difference (p-value ≤ 0.05) between the groups in clinical parameter such as site specific PI (group I base line – 1.96 ± 0.42 mm, 6 months – 0.58 ± 0.26 mm, group II base line – 1.91 ± 0.30 mm, 6 months – 0.48 ± 0.23 mm), site specific sulcus SBI (group I base line – 1.4 ± 0.52 mm, 6 months – 0.3 ± 0.48 mm, group II base line – 1.5 ± 0.53 mm, 6 months – 0.3 ± 0.48 mm), VPD (group I base line – 6.00 ± 0.0.82 mm, 6 months – 1.70 ± 1.06 mm, group II base line – 6.30 ± 0.95 mm, 6 months – 1.20 ± 0.79 mm), HPD (group I base line – 3.80 ± 0.79 mm, 6 months – 0.80 ± 0.79 mm, group II base line – 3.60 ± 0.84 mm, 6 months – 0.70 ± 0.67 mm), RVCAL (group I base line – 6.90 ± 0.57 mm, 6 months – 2.20 ± 0.63 mm, group II base line – 6.70 ± 0.82 mm, 6 months – 2.10 ± 1.37 mm), RHCAL (group I Base line – 4.10 ± 0.74 mm, 6 months – 0.70 ± 0.67 mm, group II base line – 3.80 ± 0.79 mm, 6 months – 0.90 ± 0.74 mm) at 6 months (Table 3).

For radiographic parameters, in intergroup comparison, group I and group II showed no significant difference between the groups in radiographic parameter vertical height of furcation (group I base line – 2.43 ± 0.89 mm, 6 months – 0.76 ± 0.20 mm, group II base line – 1.67 ± 0.85 mm, 6 months – 0.53 ± 0.13 mm), and H-DOF (group I base line – 2.26 ± 0.81 mm, 6 months – 0.74 ± 0.38 mm, group II base line – 2.25 ± 0.66 mm, 6 months – 0.54 ± 0.28 mm) at 6 months (Table 4).

No adverse effects such as soft tissue irritation, allergic reaction, bleeding, or pain were observed in patients. Both group I (amnion) and group II (chorion) showed good results in the treatment of furcation defects as regenerative material. However, no significant difference was observed between the regenerative efficacy of chorion and amnion membrane.

Discussion

The furcation involving the mandibular molar responds less favorably to conventional periodontal therapy. The therapeutic modalities are adopted based on grade, morphology, and severity

Table 3: Inter-group comparison of clinical parameters between group I and group II

	Group I		*Group II*		*Independent sample t-test*		
	Mean	*SD*	*Mean*	*SD*	*Mean difference*	*t-value*	*p-value*
PI							
Baseline	1.96	0.42	1.91	0.30	0.05	0.31	0.76
Baseline to 3 months	0.73	0.28	0.73	0.16	0	0	1
3–6 months	0.58	0.26	0.48	0.23	1	0.93	0.37
SBI							
Baseline	1.4	0.52	1.5	0.53	0.1	–0.43	0.67
Baseline to 3 months	0.4	0.52	0.5	0.53	0.1	–0.43	0.67
3–6 months	0.3	0.48	0.3	0.48	0	0	1
VPD							
Baseline	6.00	0.82	6.30	0.95	0.30	–0.76	0.46
Baseline to 3 months	1.70	0.48	1.90	0.74	0.2	–0.72	0.48
3–6 months	1.70	1.06	1.20	0.79	0.50	1.20	0.25
HPD							
Baseline	3.80	0.79	3.60	0.84	0.20	0.55	0.59
Baseline to 3 months	1.50	0.71	1.20	0.63	0.3	1.00	0.33
3–6 months	0.80	0.79	0.70	0.67	0.10	0.30	0.76
RVCAL							
Baseline	6.90	0.57	6.70	0.82	0.20	0.63	0.54
Baseline to 3 months	2.00	0.94	2.00	1.15	0	0.01	1.00
3–6 months	2.20	0.63	2.10	1.37	0.10	0.21	0.84
RHCAL							
Baseline	4.10	0.74	3.80	0.79	0.30	0.88	0.39
Baseline to 3 months	1.70	0.82	1.10	0.88	0.6	1.58	0.13
3–6 months	0.70	0.67	0.90	0.74	0.20	–0.63	0.54

$p < 0.05$ is considered significant, *t*-value, test value; *p*-value, probability value; HPD, horizontal probing depth; PI, plaque index; RHCAL, relative horizontal clinical attachment level; RVCAL, relative vertical clinical attachment level; SBI, sulcular bleeding index; SD, standard deviation; VPD, vertical probing depth

Table 4: Inter-group comparison of radiographic parameters between group I and group II

	Group I		*Group II*		*Independent sample t-test*		
	Mean	*SD*	*Mean*	*SD*	*Mean difference*	*t-value*	*p-value*
V-HOF							
Baseline	2.43	0.89	1.67	0.85	0.76	2.11	0.05
Baseline to 6 months	0.76	0.20	0.53	0.13	0.23	3.07	0.06
H-DOF							
Baseline	2.26	0.81	2.25	0.66	0.01	0.03	0.98
Baseline to 6 months	0.74	0.38	0.54	0.28	0.20	1.35	0.20
Bone fill percentage							
Baseline to 6 months	74.40	8.55	66.90	9.47	7.50	1.86	0.08

$p < 0.05$ is considered significant; *t*-value, test value, *p*-value, probability value; H-DOF, horizontal depth of furcation; SD, standard deviation; V-HOF, vertical height of furcation

of destruction. The modalities include open debridement along with resective or regenerative procedures. In recent years bone augmentation and GTR have been extensively used in clinical practice.[15]

Amnion membrane is a thin, tough, and transparent membrane that closely mimics the basement membrane of human oral mucosa with self-adherence and good aesthetic properties and appears to be smooth, shiny, and easily manageable. The chorion membrane is coarse and porous, and it is 4 times thicker than the amnion membrane, thus containing a higher amount of cytokines and growth factors.[16,17]

Collagen layers of both amnion and chorion are rich in proteins like type I, IV, V, and VI collagen, proteoglycans, laminin, and fibronectin. These membranes act as a matrix for cellular migration and proliferation but also enhance wound healing with the repair or regeneration of lost structure.[16,17] However is a void in the field of research comparing the regenerative efficacy of amnion and chorion membranes with each other in periodontal furcation defects. Hence this double-blind, parallel-arm, randomized study was undertaken.

Demineralized freeze-dried bone allograft is a material that promotes regeneration of the attachment apparatus. Ideally, DFDBA has osteogenic potential which induces host cells to differentiate

into osteoblasts, which act as a scaffold for new bone formation. These approaches used the principles of GTR either by monotherapy or in combination therapy to achieve better regeneration.[9,18]

Three-dimensional radiographic analysis such as CBCT has the potential to enlighten the clinician and allow for enhanced diagnosis and treatment. The two-dimensional radiography is particularly limited in detecting FI and intrabody defects. In contrast, CBCT has good potential and investigators have demonstrated its superiority in assessing the depth of furcation, the inter-radicular bone, and the molar's periodontal tissue support compared to conventional two-dimensional radiographic imaging.[19]

Out of 23 participants identified for the study 3 did not consent to participate. Hence the study was conducted on the remaining 20 participants and was randomly allocated to group I and group II with 10 patients per group.

The results of significant improvement in the clinical and radiographic parameters of group I of the present study are comparable to Pajnigara et al. which showed greater regenerative efficacy of amnion membrane in grade II furcation defects.[20] On a similar ground, the result of significant improvement in the clinical and radiographic parameters of group II of the study can be compared to Shah et al. study showing the efficacy of chorion membranes in the treatment of grade II furcation defects.[14]

In intergroup comparison, the results showed that the clinical and radiographic parameters showed no significant difference between the groups at 3 and 6 months. The results are in accordance with the findings of in vitro study by Marvin et al. which concluded that the amount and presence of the growth factors in membranes vary only according to the stage of gestation and not between the two types of membranes.[21] This suggests that there is no significant difference between amnion and chorion membranes in the composition of growth factors required for periodontal regeneration.[22] The results of our present study are also in accordance with the case series published by Pundir et al.[23]

Temraz et al. compared the clinical and radiographic outcomes of the amnion-chorion membrane (ACM) with demineralized bone matrix (DBM) in a putty form in the management of periodontal intrabony defects. The difference between the two treatment modalities was not statistically significant at different time intervals and implied that both biomaterials have a potential regenerative capacity in treating periodontal intrabony defects.[24] These findings are like the findings of the present study.

The results are also in accordance with the findings of Gupta et al. who conducted a clinical and ultrasonographic study for comparison and evaluation of the efficacy of amnion and chorion membranes in the treatment of gingival recession and their effect on gingival biotype The study measured the efficacy in terms of clinical parameters like PI, gingival index, probing depth, relative clinical attachment level, the position of the gingival margin and the gingival thickness measured by manual and chorion. This study is very much comparable to the present study in terms of materials and measurements.[12]

Hamdy et al. compared the clinical and radiographic outcomes of ACM with DBM in a putty form in the management of periodontal intrabony defects. The results showed that both biomaterials have similar potential regenerative capacity in treating periodontal intrabony defects. The findings are in concurrence to the findings of the present study where the regenerative efficacy of membranes was compared in the furcation defects.[25]

The study had numerous strengths such as having conducted in a well-defined homogenous sample applying stringent inclusion and exclusion criteria, usage of standard clinical and radiographic parameters, period sampling used to minimize selection bias, using flipping a coin for random allocation to study groups to minimize the allocation bias and having the patient and one of the clinicians blinded of the membrane chosen.

However, the study also had limitations such as having been conducted in patients seeking treatment from an academic dental institution which made it impossible to be generalized to all patients with similar defects or to the general population. The study was also limited because of the absence of a placebo control group and the fact that only buccal degree II furcation defects in mandibular molars were studied making it impossible to be generalized to all other kinds of defects in other types of teeth. Moreover, the sample size was relatively small. In addition, limitations also include difficulties caused by the COVID-19 pandemic in measuring clinical parameters by wearing optically un-tested and non-standardized face shields and personal protective goggles.

Within the given limitations and in the future directions of this study, it would be worth suggesting that a similar study conducted in community settings and various kinds of clinical settings with larger samples, followed up for a longer duration involving various types of defects would give more generalizable results. Further studies could be performed using a split arm design to evaluate the efficacy of chorion and amnion membranes in periodontal regeneration.

Conclusion

Based on overall clinical and radiographic observations, both group I and group II showed good results in the treatment of furcation defects as regenerative material. However, intergroup comparison results showed no significant difference between group I and group II. Thus, concluded that both amnion and chorion membranes had similar regenerative efficacy in combination with DFDBA in patients with buccal degree II furcation defects in mandibular molars.

Authors' Contributions

- M Siddharth – Concept, design, definition of intellectual content, manuscript review
- Anusha Raj – Literature search, clinical study, experimental study, data acquisition data analysis and statistical analysis, manuscript review
- Radhika Gupta – Concept, design, definition of intellectual content, manuscript review, data analysis and statistical analysis, manuscript review, guarantor
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