Research Article

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Effect of Periosteum as A Barrier Membrane in Grade II Furcation of Mandibular Molar

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ABSTRACT

Aim: To study the effect of the periosteum as a Barrier Membrane in treatment of Grade II furcation of Mandibular Molars.

Materials & Methods: This study was conducted in 2 groups in Group I patients were treated with bone graft material with periosteum as a barrier membrane. In Group II patients were treated with bone graft alone. Clinical parameters Gingival Index, Plaque Index, Probing pocket depth, clinical attachment level and Horizontal measurement of furcation defect were recorded at baseline and six months postoperatively.

Results: Improvement in all clinical parameters were found, and change was statistically significant in both the groups.

Conclusion: It is concluded that autogenous periosteum membrane as a barrier membrane is efficient in the treatment of Grade II furcation of mandibular molars.

Keywords: Barrier Membrane, Grade II furcation, periosteum.

INTRODUCTION

The progress of the inflammatory periodontal disease, if unabated, ultimately results in attachment loss sufficient enough to affect the bifurcation or trifurcation of multirooted teeth. The furcation is an area of complex anatomic morphology that may be difficult to be debrided by routine periodontal instrumentation. Routine home care methods may not keep the furcation area free of plaque. The presence of furcation involvement is one clinical finding that can lead to a diagnosis of advanced periodontitis and potentially to a less favourable prognosis for the affected teeth. Furcation involvement, therefore, presents both diagnostic and therapeutic dilemmas.[1]

Various materials are currently used in clinical practice; however, the benefits are closely offset by potential hazardous effects. Furthermore, unlike osteogenic cell-populated membranes, acellular membranes do not have the ability to form new bone. Together, these factors have contributed to a growing interest in studying regeneration techniques using autologous cells. The periosteum is comprised of two tissue layers: the outer fibroblast layer that provides attachment to soft

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tissue, and the inner cambial region that contains a pool of undifferentiated mesenchymal cells, which support bone formation. Recently, studies have reported the existence of osteogenic progenitors, similar to mesenchymal stem cells in the periosteum. Under the appropriate culture conditions, periosteal cells secrete extracellular matrix and form a membranous structure. The periosteum can be easily harvested from the patient's own oral cavity, where the resulting donor site wound is invisible. Owing to the above reasons, the periosteum offers a rich cell source for bone tissue engineering.[2] In this study, an attempt has been made to evaluate the effect of the periosteum as a barrier membrane in grade II furcation of mandibular molars.

MATERIALS & METHODS

The present study included ten patients having Grade II furcations defect in mandibular molars both sides. Before starting this clinical study, a detail case history of the patient was taken. The surgical procedure was explained to the patient, and written consent was taken. Clinical parameters recorded at baseline and six months postoperatively in this study were Gingival Index [3], Plaque Index 1964[4], Probing pocket depth, clinical attachment level and Horizontal measurement of furcation defect. This study was conducted in 2 groups. In Group I patients were treated with bone graft material with periosteum as a barrier membrane for Grade II furcation defect in Mandibular Molar and in group II patients were treated with bone graft alone for Grade II furcation defect in Mandibular Molar. The extraoral surface of the patient was swabbed with 5% povidone-iodine solution. The operative site was anaesthetized with 2% xylocaine HCL with adrenaline (1: 100,000), using nerve block and by infiltration techniques. The crevicular incisions were given on the buccal and lingual sides using the Bard-Parker handle no: 3 with a blade no: 15 two teeth mesial and one tooth distal to gain adequate access. A full-thickness mucoperiosteal flap was reflected by using the periosteal elevator, taking care that, the interdental papillary tissue was retained as much as possible. After reflection of the flap and exposure of the furcation, thorough surgical debridement was done using curettes. The surgical site was thoroughly irrigated with normal saline.

Fig 1: Pre operative photograph.

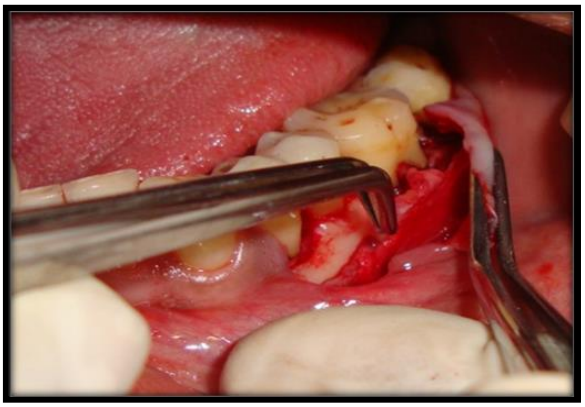


Fig 2: Periosteum dissected.

Fig 3: Periosteum mobilized.

Group I: In this group periosteum as a barrier membrane was placed over the furcation area to cover the defect according to *Saimbi Technique*.[5] One vertical incision with blade No 15 on the mesial end of the flap and a horizontal incision was given to separate periosteum from the flap, but it was attached to mucoperiosteal flap posteriorly, so that blood supply is maintained. The required quantity of bone graft material was transferred to the dappen dish and hydrated with saline. After mixing when it changed to cohesive mass, it was delivered

into the osseous defect in light increments. The material was packed from the base of the furcation to the approximate level of the crest of the remaining osseous walls, but overfilling of the defect was avoided. Then periosteum was mobilized and placed over defect so that it covered the defect completely and sutured with resorbable suture material (vicryl suture material).

Fig 4: Periosteum sutured as membrane.

Group II: The required quantity of bone graft material was transferred to the dappen dish and hydrated with saline. After mixing when it changed to cohesive mass, it was delivered into the osseous defect in light increments. The material was packed from the base of the furcation to the approximate level of the crest of the remaining osseous walls, but overfilling of the defect was avoided.

The mucoperiosteal flaps were repositioned and secured in place by interrupted suture using the black braided (3-0) silk. The surgical area was protected and covered with a non-eugenol dressing (Coe-Pac).

All patients were prescribed systemic Amoxicillin 500 mg thrice daily for seven days and a combination of Ibuprofen 400mg and Paracetamol 500 mg thrice daily for five days, followed by same if pain persists.

After six months post-operatively, the statistical analysis was done using SPSS (Statistical Package for Social Sciences) Version 15.0 statistical Analysis Software. The values were represented in Number (%) and Mean±SD. Significance of difference (Wilcoxon signed-rank test) was used for calculating 'p' value.

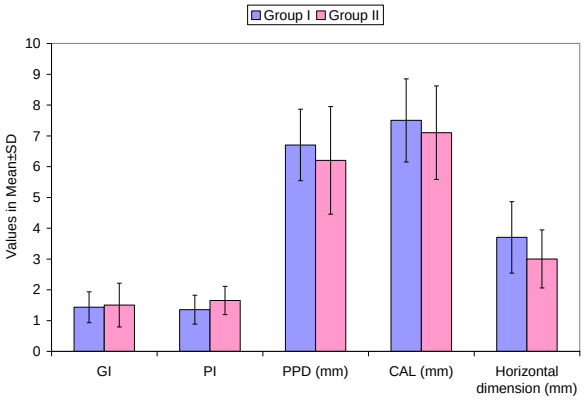
RESULTS

A split-mouth approach was adopted with patients managed with using osseous graft comprising the Group I of the present study and the other site was managed by use of periosteum as a Barrier Membrane for treatment of grade II furcation defect at one site.

Age of patients ranged from 23 to 45 years with a mean age of 36.50 and a standard deviation of 7.31 years. At baseline Gingival Index (GI) was 1.43 ± 0.50 for Group I & 1.50 ± 0.71 for Group II; Plaque Index (PI) was 1.35 ± 0.47 for Group I & 1.65 ± 0.46 for Group II; Periodontal Probing Depth (PPD) (mm) was 6.70 ± 1.16 for Group I & 6.20 ± 1.75 for Group II; Clinical Attachment Level (CAL) (mm) was 7.50 ± 1.35 for Group I & 7.10 ± 1.52 for Group II; Horizontal dimension (mm) was 3.70 ± 1.16 for Group I & 3.00 ± 0.94 for Group II.

Table 1: Comparison of parameters between two groups at baseline

SN	Parameter	Group I		Group II	
		Mean	SD	Mean	SD
1.	GI	1.43	0.50	1.50	0.71
2.	PI	1.35	0.47	1.65	0.46
3.	PPD (mm)	6.70	1.16	6.20	1.75
4.	CAL (mm)	7.50	1.35	7.10	1.52
5.	Horizontal dimension (mm)	3.70	1.16	3.00	0.94



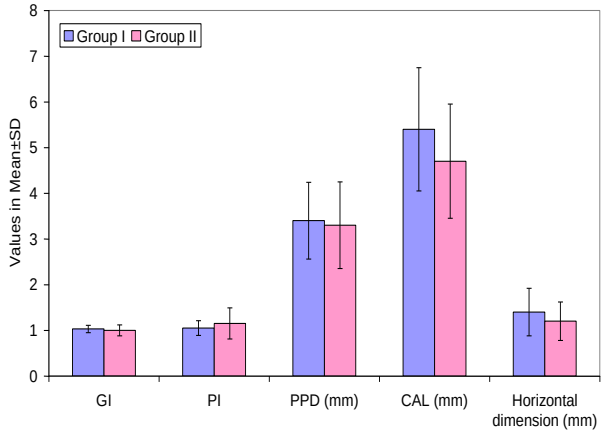
Graph 1: Comparison of parameters between the two groups at baseline

After treatment GI was 1.03 ± 0.08 for Group I & 1.00 ± 0.12 for Group II ; PI was 1.05 ± 0.16 for Group I & 1.15 ± 0.34 for Group II; PPP(mm) was 3.40 ± 0.84 for Group I & 3.30 ± 0.95 for Group II;

CAL(mm) was 5.40 ± 1.35 for Group I & 4.70 ± 1.25 for Group II; Horizontal dimension (mm) was 1.40 ± 0.52 for Group I & 1.20 ± 0.42 for Group II.

Table 2: Comparison of parameters between two groups after six months postoperatively.

SN	Parameter	Group I		Group II	
		Mean	SD	Mean	SD
1.	GI	1.03	0.08	1.00	0.12
2.	PI	1.05	0.16	1.15	0.34
3.	PPD (mm)	3.40	0.84	3.30	0.95
4.	CAL (mm)	5.40	1.35	4.70	1.25
5.	Horizontal dimension (mm)	1.40	0.52	1.20	0.42

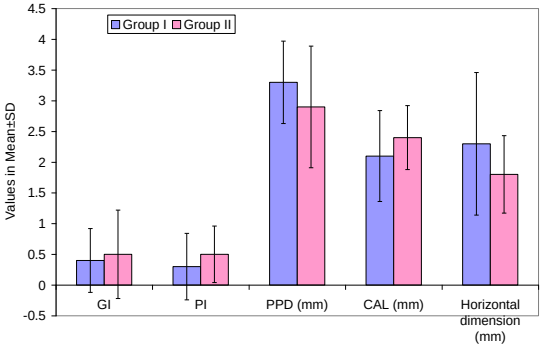


Graph 2: Comparison of parameters between two groups after 6 months post operatively

On comparision of various parameters before and after treatment in Group I and Group II, a reduction in all the parameters was observed following treatment which was also significant statistically ($p<0.05$).

Table 3: Comparison of extent of change in various parameters between two groups post operatively

SN	Parameter	Group I		Group II	
		Mean	SD	Mean	SD
1.	GI	0.40	0.52	0.50	0.72
2.	PI	0.30	0.54	0.50	0.46
3.	PPD (mm)	3.30	0.67	2.90	0.99
4.	CAL (mm)	2.10	0.74	2.40	0.52
5.	Horizontal dimension (mm)	2.30	1.16	1.80	0.63

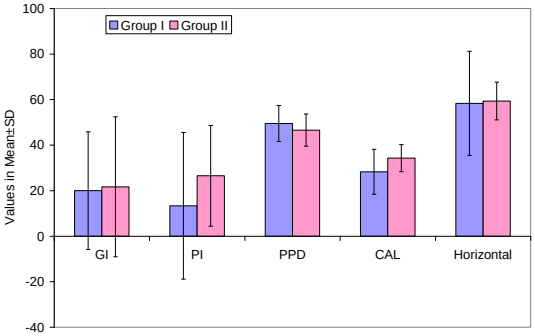


Graph 3: Comparison of extent of change in various parameters between two groups post operatively

For parameters, GI, PI and CAL, change in Group II was higher as compared to Group I whereas for parameters PPD and Horizontal dimension, change in Group I was higher as compared to that in Group II. However, both the groups were statistically matched after treatment extent of change too.

Table 4: Comparison of percentage of Change in various parameters between two groups postoperatively

SN	Parameter	Group I		Group II	
		Mean	SD	Mean	SD
1.	GI	20.00	25.82	21.67	30.73
2.	PI	13.33	32.20	26.50	22.12
3.	PPD	49.49	7.88	46.57	7.04
4.	CAL	28.27	9.89	34.26	5.97
5.	Horizontal dimension (mm)	58.33	22.88	59.33	8.29



Graph 4: Comparison of percentage of Change in various parameters between two groups post operatively

In both the groups, maximum percentage change was observed for horizontal measurement. In Group I minimum change was observed in PI whereas in Group II, minimum change was observed in GI.

Mean % Change was higher in Group I as compared to Group II for all the parameters except PPD. For PPD, mean % change in Group I was higher as compared to that in Group II. However, comparison of change between two groups did not show a statistically significant difference between two groups (p>0.05). Thus, showing that the two groups were matched for % change in periodontal health following treatment.

DISCUSSION

Membrane placement is based on the biological principles of guided tissue regeneration; it is used to prevent the apical migration of gingival epithelial cells during the first stages of periodontal healing to allow periodontal ligament cells to repopulate the root surface.[6] Guided tissue regeneration is a surgical treatment procedure for periodontal disease that utilizes a barrier membrane to induce the growth of bone and periodontal tissue at sites where the volumes or dimensions of the periodontal tissue are insufficient. GTR has been proven effective in both animal studies and clinical trials.[7]

A number of resorbable and non-resorbable guided tissue regeneration (GTR) materials have been proposed to exclude epithelium and the gingival corium from the root in order to delay epithelial downgrowth during healing and to provide an opportunity for the progenitor cells of the periodontal ligament and bone to repopulate previously diseased root surfaces. Several studies in animals [8,9] and in humans[10] have demonstrated that different levels of periodontal regeneration can be achieved with GTR. Nonresorbable membranes made of expanded polytetrafluoroethylene (ePTFE) are the most widely investigated barrier membranes. [11,12]

The use of bioresorbable barriers, such as collagen, polylactic acid, polyglycolic acid[13] was found to solve several of the shortcomings of the non-resorbable membranes. Bioresorbable barriers eliminate the need for a second surgery to remove the membrane and decrease the associated disturbances of the newly formed osteoid that may result in bone resorption.

The potential of periosteum in the formation and regeneration of bone tissue has been demonstrated in a number of studies and case reports. It was shown that (a) periosteum is able to induce bone formation when grafted to ectopic areas, (b) the presence of periosteum on the inside of a flap enhances bone regeneration, and (c) significant amounts of new bone can be regenerated by periosteum without space.[14]

Numerous precious studies of periosteum, evaluating its osteogenic activity and the issues affecting this potential, have been performed. Precursors of the bone tissue cells transform to preosteoblasts under convenient circumstances and stimuli and then to osteoblasts and finally osteocytes. Many observers [15- 19] have tried to demonstrate the osteogenic potential of periosteum. In this study, we tried to evaluate the effect of the periosteum as a barrier membrane in the treatment of Grade II furcation of mandibular molars and its effect on other clinical parameters.

Barrier membranes are bio-inert materials that serve to protect the blood clot and prevent soft tissue cells (epithelium and connective tissue) from migrating into the bone defect, allowing osteogenic cells to be established. The disadvantage of a non-resorbable barrier membrane is that if it becomes exposed, it will not heal spontaneously. Exposed membranes become contaminated with oral bacteria, which may lead to infection of the site and result in bone loss. Hence exposed membranes must be removed. Early removal may also result in less bone regeneration. The primary advantage of a resorbable membrane is the elimination of a surgical reentry for membrane removal.

The use of an autogenous connective tissue graft, including the periosteal layers, as a barrier in the treatment of human periodontal defects, may have the following advantages: requires only one surgical procedure; minimizes any untoward tissue responses during healing; and may have the potential for stimulating new bone formation.[20]

Periosteum provides the clinician with an excellent alternative for periodontal regeneration in furcation areas. Periosteum can be easily harvested, does not require a second surgical procedure for removal, and does not pose any risk of disease transmission to the patient. New bone formation, one of the main goals in periodontal regeneration, can be observed consistently and takes place at a faster rate with

periosteum as barrier membrane than coronally placed flaps.[18]

Periosteum as barrier membrane has various advantages when compared to other barrier membranes, and it fulfils all the ideal criteria. Being a resorbable type second surgery to remove it is not necessary. Also, being a pedicle autograft vascular supply is maintained. This barrier membrane is easy to harvest and use for treatment. Thus, the periosteum is an effective alternative to the existing barrier membranes. The results obtained from this study were in accordance with the previous studies [18-19, 21-23] who observed and demonstrated the osteogenic potential of periosteum.

The results of this study indicate that autogenous periosteum as a barrier membrane was effective in treating furcation defect in mandibular molars. The reduction in Gingival Index and Plaque Index, gain in probing depth and clinical attachment level was noticed with improvement in the horizontal bone level of furcation.

This study showed successful guided tissue regeneration with the use of periosteum as a barrier membrane.

CONCLUSION

A reduction in all the parameters was observed following treatment in both the groups, which were also significant statistically. Statistically, no significant difference was observed between two groups for any of the clinical parameters. For parameters, GI, PI and CAL, change in Group II was higher as compared to Group I whereas for parameters PPD and Horizontal dimension, change in Group I was higher as compared to that in Group II.

The periosteum is bioresorbable barrier membrane, so second surgery for removal is not necessary; it is easy harvest and manipulate, and is cost effective. From this study it can be concluded that autogeneous peddicle periosteum graft as a barrier membrane is efficient in treating Grade II furcation of mandibular molars.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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