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ORIGINAL RESEARCH

Clinical and Radiological Evaluation of Human Osseous Defects (Mandibular Grade II Furcation Involvement) Treated with Bioresorbable Memberane: Vicryl Mesh

KV Balusubramanya, R Ramya, SJ Govindaraj

ABSTRACT

Aim: The purpose of the present study was to evaluate clinical and radiological healing effects after treatment of class II furcation defects using bioresorbable periodontal mesh barriers.

Materials and methods: The patients for the following study were selected from Outpatient, Department of Periodontics, College of Dental Sciences, Davanagere, Karnataka.

Inclusion criteria:

1. Patients with age group between 18 and 60 years.
2. Patients who were nonsmokers.
3. Patients who had not undergone any type of periodontal therapy 6 months prior to initial examination.
4. Patients diagnosed as advanced periodontitis having mandibular grade II furcation involvement (Glickman 1953) clinically and radiologically.

Exclusion criteria:

1. Patients who required antibiotic prophylaxis.
2. Patients allergic to tetracycline and/ or chlorhexidine.
3. Pregnant and lactating mother.
4. Patient showing unacceptable oral hygiene during pre-surgical (phase 1) therapy.

Results: In this study clinical parameters were compared and attempt was made to compare the results radiographically too, with the limitations, the present study showed that the use of resorbable periodontal mesh barriers for GTR therapy at class II furcations resulted in reduction of furcation involvement.

Conclusion: Therefore it appears that a patient with class II furcations involvement benefits from barrier treatment, because results are superior to conventional treatment without barriers.

Clinical significance: The present study was taken up to evaluate the clinical effects of GTR therapy of class II furcations using bioresorbable periodontal mesh barriers.

Keywords: Guided tissue regeneration therapy, Class II furcation, Bioresorbable periodontal mesh barriers, Vicryl mesh, Occlussal stents, Radiographic measurement.

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INTRODUCTION

The challenge of periodontal regeneration has become a central issue in periodontal research and practice. The objective, of course, is to reconstitute the biologic complex of cementum, periodontal ligament and alveolar bone onto the root surfaces associated with marginal periodontitis.

Some techniques have demonstrated clinical success, in varying degrees, in promoting periodontal regeneration and/ or bone fill in periodontally diseased sites. They are (1) use of bone inductive graft material (2) guided cell repopulation using barrier membranes (3) coronally positioned flap procedures.[1]

Barrier membranes effectively eliminate gingival epithelium and gingival connective tissue from healing wound, also seem to protect the healing clot by eliminating the effect of the flap margin on the healing site. To avoid secondary procedures, investigators have evaluated the efficacy of biodegradable materials to determine, if they could provide results equivalent to nonbiodegradable barrier.

Long term follow-up of periodontal therapy indicates that the majority of periodontal lesions will respond well to treatment. Exceptions are lesions in multi-rooted teeth that have advanced into the furcation area between the roots. The newer aspect of treatment involves the utilization of regenerative procedures for the treatment of furcation defects which includes surgical approaches like root conditioning with coronally displaced flap, placement of bone graft or bone substitute implants, use of organic or synthetic barrier membranes based on the principles of guided tissue regeneration.[2] Furcation treatment represents

a clinical challenge for the clinician. The prognosis of multi-rooted teeth with loss of periodontal attachment in the interradicular area depends on the extent of lost attachment, morphology of interradicular septum, length, number, shape and divergence of roots; divergence of root trunk and relationship of level of interradicular septum to adjacent osseous structures, root proximity to adjacent teeth.[3]

MATERIALS AND METHODS

The patients for the following study were selected from Outpatient, Department of Periodontics, College of Dental Sciences, Davanagere, Karnataka.

Inclusion Criteria

1. Patients with age group between 18 and 60 years.
2. Patients who were nonsmokers.
3. Patients who had not undergone any type of periodontal therapy 6 months prior to initial examination.
4. Patients diagnosed as advanced periodontitis having mandibular grade II furcation involvement (Glickman 1953) clinically and radiologically.

Exclusion Criteria

1. Patients who required antibiotic prophylaxis.
2. Patients allergic to tetracycline and/ or chlorhexidine.
3. Pregnant and lactating mother.
4. Patient showing unacceptable oral hygiene during pre-surgical (phase 1) therapy.

Design of the Study

Seven patients with 22 furcation defects were selected after the completion of initial phase of periodontal treatment. Out of the selected sites in a patient, control and experimental sites were selected randomly and treated according to the split mouth design.

Control Site

Eleven sites were treated with open debridement.

Experimental Site

Eleven sites were treated with open debridement and placement of vicryl mesh (Guided tissue regeneration membrane).

STATISTICAL ANALYSIS

Changes in the vertical and horizontal probing depth in both experimental and control groups were analyzed by paired t-test within a group (intra-group), inter-group comparison was done by unpaired t-test.

Clinical Parameters

The following clinical parameters were recorded at baseline, 4 and 6 months postsurgery.

Vertical Measurements

1. Fixed reference point (FRP) to base of the pocket (BOP).
2. Fixed reference point (FRP) to cementoenamel junction (CEJ).
3. Fixed reference point (FRP) to gingival margin (GM).

Horizontal Measurements

1. Direct probing into the furcation defect without stent.
2. Reference point (RP) to depth of furcation defect (DOF) with stent.

All the measurements were standardized using customized acrylic stent with groove, which were prepared on the study model of the patients. The recordings were made using a Hu-friedy PCP-UNC 15 periodontal probe.

Stent Preparation

Study models were made for fabrication of stents. Two different types of stents were made, one for the vertical measurements and other for horizontal measurements.

Occlusal Stent for Vertical Measurements

Acrylic was used to make the stent. Separating media (Vaseline) was applied over the area on the cast where the stent was to be made. Monomer and polymer were mixed together in a dappen dish. When the mixture attained dough stage, the material was placed over the teeth where the stent was required, then adapted over the cast using digital pressure. Excess material was cut out using a BP blade before the material was set. After the material was set, the stent was removed, sharp edges were smoothened and trimmed to the middle one-third of the tooth. A vertical groove was made at the middle of the tooth to guide placement of the probe in the same direction repeatedly during measurement to avoid any variation. The same procedure was followed to prepare all the stents used in this study. The lower/apical limit of the vertical groove was used as the fixed reference point for the vertical probing depths. If the fixed reference point was between two markings of the probe, then the reading was rounded off to the next highest millimeter.

Stent for Horizontal Measurement

Clear acrylic was used to make stents for horizontal probing similar to the stents made for the vertical probing, but in this stent the material will be adapted over the occusal

surfaces of teeth and extended 2 to 3 mm to the gingival margin buccally, after the material was set a hole was made over the gingival margin buccally taking the gingival margin as a guide line. This hole will guide the periodontal probe into the furcation defect during repeated measurement to any variations. The outer surface of hole acts as the reference point for horizontal probing depth.

The following calculations were made from the clinical measurements recorded:

1. Pocket depth (FRP to BOP) - (FRP to GM).
2. Clinical attachment level (FRP to BOP) - (FRP to CEJ).
3. Gingival recession (FRP to CEJ) - (FRP to GM).

In this study a stent was designed to measure horizontal furcation depth clinically without reentry in a reliable manner at a given interval of time. Vandana KL et al (2003)[4] in their study a customized stent was prepared which was a simple modification of stent used for vertical measurements.

Radiographic Measurements

Intraoral periapical radiographs of each defect site was exposed at baseline, 4 and 6 months pre- and postsurgery using long cone/paralleling technique.

GTR Membrane used in the Study[5]

Vicryl knitted mesh (Johnson and Johnson) is synthetic material composed of copolymer made from 90% glycolide and 10% L-Lactide (Polyglactin 910). The empirical formula is $(C_2H_2O_2)m$ $(C_3H_4O_2)n$. Vicryl mesh can be sterilized by ethylene oxide gas.[6] It is recommended to store below 25°C and away from the moisture and direct heat. Subcutaneous implantation studies have reported that absorption of vicryl mesh material is minimal until about 6 weeks and essentially complete between 60 and 90 days postimplantation.

Presurgical Procedure

All the selected patients were given detailed instructions in self-performed plaque control measures and were subjected to phase I therapy. Selective grinding in cases with traumatic occlusion was considered. Two weeks after phase I therapy the patients were subjected to surgical procedures.

SURGICAL PROCEDURES

On completion of baseline examination and thorough initial therapy (scaling and root planing) the furcation defect were randomly assigned as either control or experimental site.

Patient was seated comfortably in the dental chair and then asked to rinse the mouth with 10 ml of 0.2% of chlorhexidine gluconate solution. The extraoral surfaces of the patient were swabbed with 5% povidone iodine solution.

The operative site was anesthetized with 2% Xylocaine HCL with adrenaline (1:80,000) using block and infiltration techniques. The crevicular incisions were given on the buccal and lingual sides using Bard-Parker handle with blade no. 15. A full thickness mucoperiosteal flap was raised using the periosteal elevator taking care to preserve the interdental papilla as much as possible. After the flap was reflected the osseous defects were exposed, a thorough surgical debridement of both soft and hard tissues was carried out using the area specific curettes (Fig. 1). Surgical site was irrigated copiously using normal saline. In experimental site, from 15 × 15 cm vicryl membrane, a sufficient membrane was taken by using a sterile template of tin foil which is covering the defect in such a way that it has to overlap the walls of the defect by at least 2 to 3 mm all sides to allow complete bone contact. The membrane was adapted to the root trunk by pre-placed circumferential resorbable sutures using vicryl 3-0 sutures (Fig. 2). The mucoperiosteal flaps were coronally positioned and secured in place using a 3/8 circle, reverse cutting swaged needle and 3-0 black-braided silk suture. Interrupted sutures were placed to obtain primary

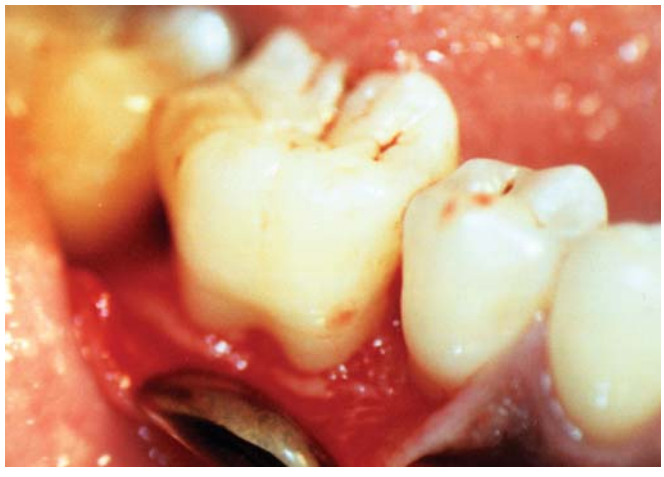

Fig. 1: Flap reflection and debridement

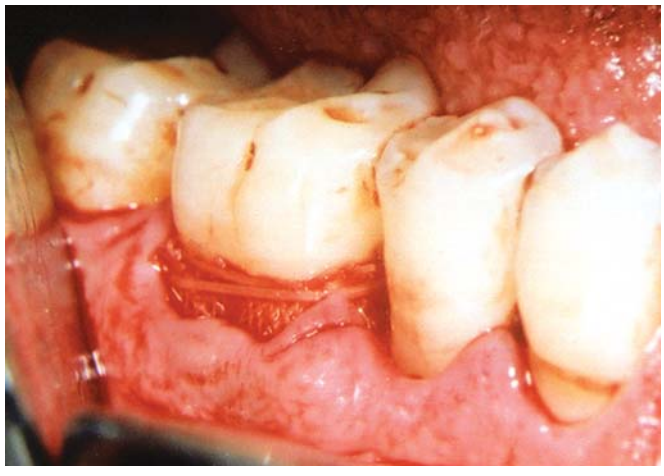

Fig. 2: Sutured vicryl mesh in defect site

closure of the interdental papilla and the area was protected with a noneugenol dressing (Voco-Pac). All the patients were prescribed systemic Doxycycline HCL 200 mg for first day followed by 100 mg/ day for another 6 days along with Rofecoxib 50 mg tablet were given once daily for 3 days. Postoperative instructions were given to all the patients and they were instructed to report to the department after 24 hours of surgery and then after 10 days.

After ten days following surgery, the dressing and sutures were removed and the surgical site was irrigated with normal saline. An enquiry regarding the postsurgical problems was made and area was checked for any membrane exposure in which case the periodontal dressing was again replaced for another 7 days. Recall appointments of the patients were made after 6 weeks, 4 months and finally at 6 months. At each visit, oral hygiene instructions were reinforced, supragingival scaling was done if required.

Clinical and radiographic evaluation was done similar to baseline evaluation at fourth and sixth month. The results of study were subjected to statistical analysis (Table 1).

STATISTICAL ANALYSIS

Changes in the vertical and horizontal probing depth in both experimental and control groups were analyzed by paired t-test within a group (intra-group), inter-group comparison was done by unpaired t-test.

RESULTS

The purpose of the present study was to evaluate clinical and radiological healing effects after treatment of class II furcation defects using bioresorbable periodontal mesh barriers.

In the present study, a group of seven patients (all males) with the age group of 18 to 60 years and total 22 mandibular grade II furcation defects were selected. The selected sites were randomly divided into control and experimental sites.

- *Control sites*: Eleven sites were treated with open flap debridement.
- *Experimental sites*: 11 sites treated with open flap debridement and placement of vicryl mesh.

In all the selected sites, the following clinical parameters were assessed at baseline, 4 and 6 months postsurgery using PCP UNC –15 graduated periodontal probe (Table 2).

SUMMARY AND CONCLUSION

This study was aimed at evaluating the efficacy of vicryl mesh (Bioresorbable) membrane compared to open debridement in the treatment of mandibular grade II furcation defects. The following conclusions were drawn from this study:

1. There was no difference in plaque index score in experimental and control groups from baseline to 6 months, on comparison between experimental and control groups no statistically significant difference was found.
2. There was reduction in gingival index score in experimental and control groups from baseline to 6 months, on comparison between experimental and control groups no statistically significant difference was found.
3. There was highly statistically significant reduction in pocket depth in experimental sites, where as significant reduction in control sites from baseline to 6 months. On comparison between experimental and control groups statistically significant difference was found.
4. There was highly statistically significant reduction in clinical attachment level in experimental sites, where as significant reduction in control sites from baseline to 6 months. On comparison between experimental and control groups statistically significant difference was found.
5. There was statistically no significant change in gingival margin position at experimental and control groups from baseline to 6 months. On comparison between experimental and control groups there was statistically no significant difference was found.
6. There was statistically significant reduction in horizontal probing depth of furcation defect without using a stent at experimental (Fig. 3) and control groups from baseline to 6 months. On comparison between experimental and control groups there was statistically no significant difference was found.
7. There was statistically highly significant reduction in horizontal probing depth of furcation defect using a stent

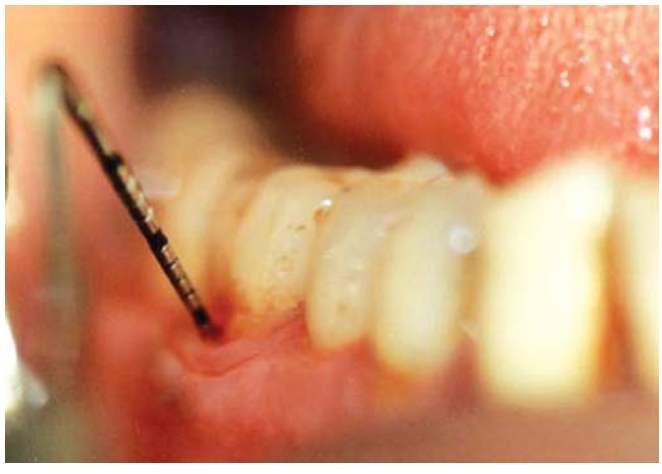

Fig. 3: Direct probing into the furcation defect

Table 1: Comparison of mean values of changes in clinical attachment level between experimental and control groups at baseline and 6th month postsurgery

Time interval	*Experimental group*					*Control group*					*Difference between groups*		
	Mean ± SD	*Difference from baseline*	*Percentage difference*	*t*-value*	*p-value*	*Mean ± SD*	*Difference from baseline*	*Percentage difference*	*t*-value*	*p-value*	*Difference in means*	*t**-value*	*p-value*
Baseline	4.09 ± 0.70	-	-	-	-	3.82 ± 0.60	-	-	-	-	0.27	0.98	0.34 (NS)
6 months	1.91 ± 0.70	2.18 ± 0.60	53.3%	7.30	<0.001 (HS)	2.73 ± 1.01	1.09 ± 0.94	28.5%	3.08	<0.01 (S)	1.09	3.25	<0.01 (S)

*Paired t-test; **Unpaired t-test; $p < 0.05$, $p < 0.01$ significant (S); $p < 0.001$ highly significant (HS)

Table 2: Comparison of mean values of horizontal furcation depth measurements between experimental and control groups at baseline and 6th month postsurgery measured with stent

Time interval	*Experimental group*					*Control group*					*Difference between groups*		
	Mean ± SD	*Difference from baseline*	*Percentage difference*	*t*-value*	*p-value*	*Mean ± SD*	*Difference from baseline*	*Percentage difference*	*t*-value*	*p-level*	*Difference in means*	*t**-value*	*p-value*
Baseline	8.27 ± 1.19	-	-	-	-	7.73 ± 1.35	-	-	-	-	0.54	1.01	0.33 (NS)
6 months	6.73 ± 0.90	1.54 ± 1.04	18.7%	4.94	<0.001 (HS)	6.36 ± 1.12	1.37 ± 1.12	17.6%	4.04	<0.01 (S)	0.17	0.40	0.70 (NS)

*Paired t-test; **Unpaired t-test; $p < 0.05$ significant (S); $p < 0.001$ highly significant (HS); $p > 0.05$ not significant (NS)

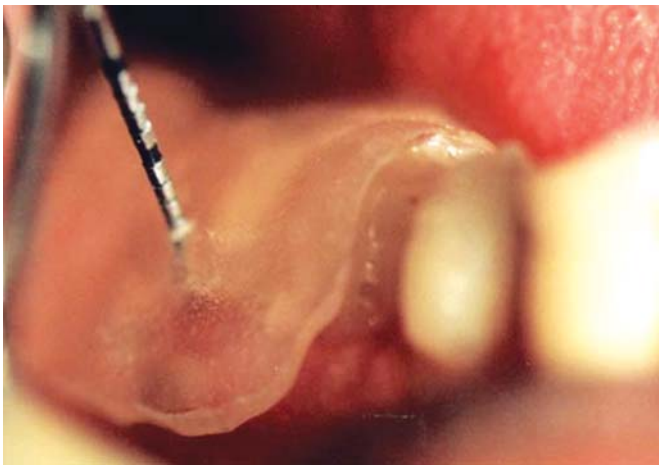

Fig. 4: Probing into the furcation defect with a stent

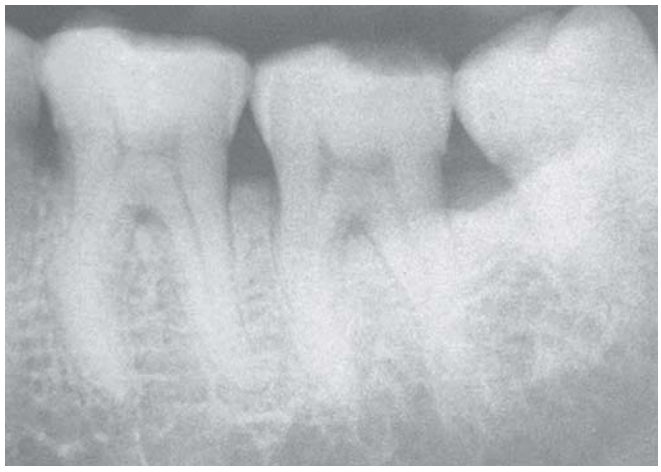

Fig. 6: Radiographic interpretation at 6 months

at experimental group, (Fig. 4) where as statistically significant in control group from baseline to 6 months. On comparison between experimental and control groups there was statistically no significant difference was found.

8. The comparison of horizontal probing depth of the furcation defect with and without using a stent was statistically not significant at both experimental and control groups.
9. As no definite bony changes were appreciable in most of the postsurgical radiographs, evaluation radiographically was not possible in this study (Figs 5 and 6).

From this study it can be concluded that the use of vicryl mesh as a barrier membrane for the treatment of human mandibular grade II furcation defects proves to be beneficial, compare to the debridement alone. Further long-term studies using the larger sample sizes should be directed towards comparison between vicryl mesh and open debridement. One of the most important indications for guided tissue regeneration (GTR) treatment is class II furcation lesion. Plaque control, membrane exposure, membrane retrieval and a regular supportive periodontal care program are necessary for successful of GTR in class II furcations.[7]

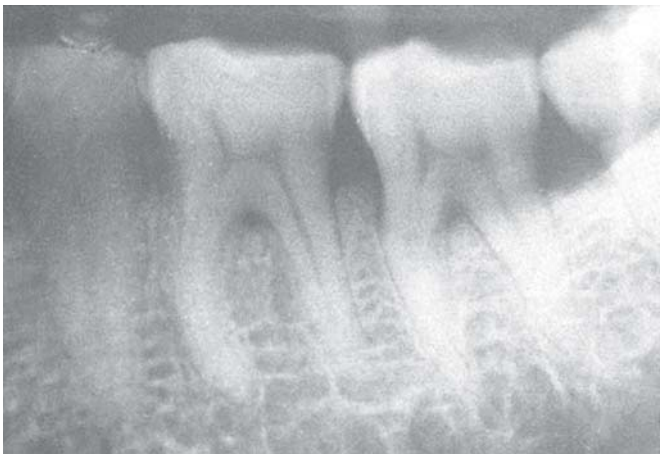

Fig. 5: Radiographic interpretation at baseline

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