

Original Article

A Comparison of bioresorbable membrane alone or in Combination with tetracycline root conditioning in treating intrabony defects

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ABSTRACT

Background: To enhance and possibly overcome limits in the biological potential, several research approaches have assessed the possible benefits of GTR modulation by root surface conditioning agents.

Objective: A Comparison of bioresorbable membrane alone or in Combination with tetracycline root conditioning in treating intrabony defects.

Material & Methods:

Study design: A case-control study.

Setting: Department of Periodontics, Subharti Dental College, Meerut Uttar Pradesh, India. **Participants:** 20 patients

Sampling: Random sampling.

Statistical Analysis: Data entry and statistical analysis were carried out using SPSS 10. Unpaired student "t" test was applied

Results: On comparing the values of pocket depth (PD) and depth of defect area (INFRA I) Group A and Group B patients at baseline and 6 months, a decrease in the PD and INFRA I after the treatment were observed. Intergroup comparison of the treatment outcomes on PD and INFRA I revealed no statistically significant difference between the two groups.

Conclusion: It was concluded that combining GTR technique with the TTC-HCl root conditioning does not improve the results in terms of clinical and radiographic outcomes.

Keywords: Guided tissue regeneration, Bioresorbable membranes, Tetracycline root conditioning

INTRODUCTION

Regeneration of periodontal structures following acid conditioning of the root surface in conjunction with gingival flap surgery was reported by Register and coworkers in the mid-seventies [1]. Later, the effect of acid conditioning on healing after surgical debridement was extensively evaluated in experimental and clinical studies [2]. The potential of acid conditioning to support periodontal regeneration has been confirmed in numerous human studies. Cole et al [3] demonstrated new connective tissue attachment in all of 10 biopsies obtained from periodontally compromised teeth which had been subjected to gingival flap surgery and acid conditioning. Recent animal and human studies have demonstrated periodontal regeneration using a treatment model allowing coronal re growth of periodontal ligament (PDL) tissues [4, 5]. This model is based on the concept

that repopulating cells and the migration potential of the different tissue types of the periodontium determine the outcome of healing, that PDL cells are the only cells with the capacity for periodontal regeneration, and that periodontal regeneration will only occur if cells from the gingival epithelium and connective tissue are prevented from contact with the root surface during the healing phase [5]. This treatment concept, accepted for clinical practice, utilizes a barrier membrane inserted between the gingival flap and the tooth and bone aspect of the periodontal defect at wound closure. The membrane is thought to inhibit apical migration of gingival epithelium along the root surface, inhibit contact of gingival connective tissue to the root surface, and allow for proliferation of PDL cells into the wound space under the membrane. Notable clinical and histological improvements have been reported with this procedure.

It has been reported that PDL cells can be induced to proliferate and migrate on biochemically conditioned dentine surfaces [6]. This proliferation and movement has been shown to be increased when tetracycline (TTC-HCl) is used to precondition the dentin surface. These workers have observed that TTC-HCl preconditioning of dentin removes the surface smear layer and partially demineralizes the dentin surface to expose collagen fibers [6].

However improved, complete regeneration following either root surface conditioning with TTC-HCl or the barrier membrane technique is still elusive. It may be hypothesized further improvement may be accomplished by combining the two treatments.

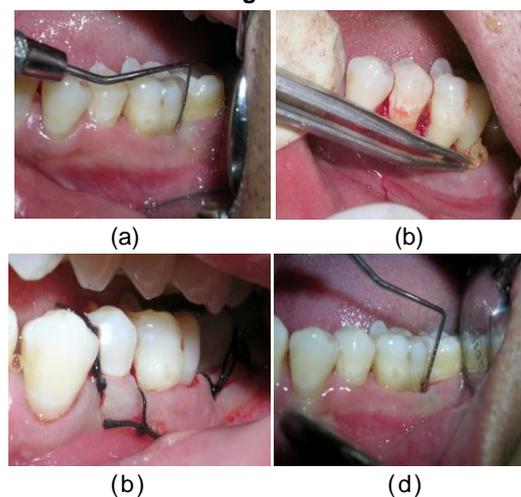
The purpose of this study was to compare a bioresorbable membrane Alone or in Combination with tetracycline root conditioning in treating intra-bony defects with the following objectives: Evaluation of pre surgical probing depths and its comparison post operatively, and to assess the change in the depth of the base of the defect after the periodontal treatment.

MATERIALS & METHODS

The area selected for surgery was anaesthetized and initial incision was made away from defect extending at least one tooth mesial and distal to the tooth to be treated. A full thickness mucoperiosteal flap was reflected 2-3mm beyond the defect. Apical to the mucogingival junction, a partial thickness flap was continued by blunt dissection to free the flap from tension. Granulation tissue was removed and curettes were used to root plan the tooth. A template was prepared from autoclave piece of mackintosh at the time of surgery that was extending 2-3mm beyond the margins of defect in all directions and the membrane was trimmed according to this template. The flap was also trimmed where required to achieve primary tension free closure [7]. Root conditioning was done only in Group A, with freshly prepared TTC-HCl solution for 3 minutes followed by generous irrigation with a sterile saline solution. The G.T.R. membrane was adapted in both Group A and Group B and sutured to the root surface by using a 5-0 resorbable suture. In cases where adequate adaptation was possible due to the defect anatomy, the membrane was adapted without the use of sutures using the pouch technique as advocated by Mattson et al [8]. The mucoperiosteal flap was repositioned to cover the membrane completely and sutured with 3-0 silk suture (FIGURE.1). Patients were prescribed Amoxicillin, 500mg three times a day for seven days and were instructed to rinse twice daily with a 0.12% chlorhexidine solution for 6 to 8 weeks. Gingival

sutures were removed and mechanical plaque control reinstated after 1 week. The patients were recalled for oral hygiene measures as needed and recalled after 3 and 6 month intervals.

Fig: 1



- a) Preoperative Pocket Depth
- b) TTC-HCl root conditioning
- c) Membrane placed & Flap sutured
- d) Postoperative Pocket Depth

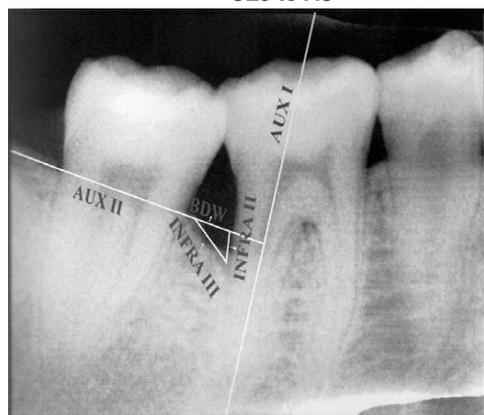
Parameters Recorded: Probing depth (PD) and depth of the base of the defect (INFRA 1) were recorded preoperatively at baseline and postoperatively at 6 months.

Radiographic parameters were obtained in a digitized format by the RV3 digital radiography software version 305 Apeteryx Inc. In order to calibrate measurement digitally the distance from the cusp tip to the cement-enamel junction was measured clinically after flap reflection and recorded. The same was measured radiographically and all further radiographic measurements were calibrated according to this scale. The following landmarks were identified on the radiographs.

Cemento enamel junction (CEJ), if the CEJ was destroyed by restorative treatment, the apical margin of restoration was taken as a landmark. Bony defect was defined as the most coronal point where the periodontal ligament space showed a continuous width (BD).

Alveolar crest was defined as the crossing of the silhouette of the alveolar crest with the root surface. The depth (Infra I) of the defect was assessed as follows [9]:

Infra I: Difference of the distance CEJ to BD minus CEJ to AC



Statistical Analysis: Data entry and statistical analysis were carried out using SPSS 10. Significant difference was determined using the unpaired student “t” test. The result was assessed using Mean \pm Standard Deviation and difference was accepted significant at more than 95% (p value <0.05).

RESULTS

On comparing the values of PD of Group A and Group B patients at baseline and at 6 months, a decrease in the PD after the treatment were observed.

Application of unpaired student “t” test post operative at 6 months at 5% and 0.01% level of significance revealed the effect to be significant i.e. $P < 0.05$ and $P < 0.001$ for the reduction in PD (Table1).

Table 1: Pocket Depths (PD) & Infra I for Study Groups at Baseline VERSUS 6 Months

GROUP	VALUES	POCKET DEPTH	INFRA I
GROUP A	MEAN \pm SD	3.5 \pm 0.72	1.02 \pm 0.16
	t-value	5.22	2.2
	p value	$P < 0.05^*$	$P < 0.05^*$
GROUP B	MEAN \pm SD	4 \pm 0.37	1.61 \pm 0.4
	t-value	10	4.8
	p-value	$P < 0.05^*$	$P < 0.05^*$

On comparing the treatment outcomes by applying the statistical unpaired “t” test to the PD and INFRA I between Groups A & B, it was observed that there was no statistically significant difference in both the groups ($P > 0.05$)(Table 2).

Table 2: Pocket Depths (PD) & Infra I for Inter Group A and B

Variable	Mean \pm SD	T-value	P-value
Pocket Depth	0.5 \pm 0.15	0.73	$P > 0.05$
INFRA I	0.59 \pm 0.02	1.78	$P > 0.05$

DISCUSSION

GTR is a technique, based on a principle of guiding the proliferation of the various periodontal tissue components during healing following periodontal surgery. Regeneration of intrabony defects by barrier membranes represents a highly efficacious and predictable treatment alternative, but some variability in results has been observed due to the biological potential of GTR falls short of the desirable outcome; different subjects may have distinct healing responses; and/or the employed surgical technique may jeopardize the regenerative potential [10].

To enhance and possibly overcome limits in the biological potential, several research approaches have assessed the possible benefits of GTR modulation by root surface conditioning agents [11]. Thus, the present study was designed to compare a bioresorbable membrane alone or in Combination with tetracycline root conditioning in treating intrabony defects.

Literature has reported that the ideal properties of a barrier for GTR procedures include the ability to exclude unwanted epithelial cells and maintain a space for appropriate cells (e.g. PDL cells, bone cells and / or cementoblasts) to repopulate the wounded area. Moreover, several studies have shown that collagen membranes provide better clinical results when compared to open flap debridement alone [12]. thus favoring the use of the collagen membrane in this study as it is economic, easily available and is well manipulated during the surgery.

The rationale for the use of TTC-HCl in this study was based on previous in vitro studies which suggested its potential usefulness in regenerative procedures [13].

Genco[14] supported the use of TTC-HCl, as a root conditioning agent due to the following reasons: it was highly efficacious against the majority of periodontopathic bacteria, it had an acidic pH and could be used as a root demineralizing agent, it inhibited human collagenase and bone resorption, and was associated with bone formation. The use of TTC-HCl was also supported by the findings that superficial demineralization by the use of demineralizing agents during regenerative periodontal surgery may remove the smear layer, demineralize cementum which facilitated a cell and fiber attachment to the cementum surface and was an important initial step in the natural healing process and new attachment formation [15]. Some studies have reported no significant differences in the treatment

outcomes after TTC-HCL and GTR [16] The present study demonstrated improvement following TTC-HCL root conditioning in conjunction with a barrier membrane. Significant improvements for TTC-HCL conditioned sites compared to non-acid conditioned sites have also been demonstrated earlier [1].

Any clinical effect of the acid conditioning in the present study may have been overshadowed by the healing potential generated by the barrier membrane. Probing depth and depth of defect site were not different between roots that were or not conditioned with tetracycline. Other animal and human studies also indicate a lack of effect of tetracycline root conditioning in periodontal regeneration [6].

Probing depth was included as an assessment parameter to potentially detect a direct effect of the therapy. A significant difference was noted in both the treatment groups with regard to probing depth during the course of the study. The intergroup analysis showed no statistically significant differences between the two parameters.

Improvement in defect bone fill was similar to earlier reports following gingival flap surgery alone. The modest improvement may possibly be explained by the postsurgical protocol. The sutures were removed one week following surgery and hygiene procedures were resumed at that time. Recent experimental findings pointed out the importance of wound stabilization for the outcome of periodontal regenerative procedures. A periodontal wound may not have reached sufficient maturity to resist mechanical tensile forces until 2 to 3 weeks after surgery. Such biologic considerations suggest that the postoperative protocol must exclude trauma from oral hygiene measures, periodontal dressings, and early suture removal and include optimal infection control.

The 6 month data of the study showed that the GTR using bioabsorbable membrane with and without tetracycline root conditioning is an effective procedure in the treatment of infrabony defects at 6 months. Both the treatments resulted in significant gain in regeneration by way of reduction in probing depths and the depth of the defect. The regeneration of the bone area was seen in terms of both the treatments but was not statistically significant in terms of either of the treatments.

CONCLUSION

The results of this study show that the GTR procedures using bioresorbable membranes offer a simple and reliable treatment alternative in cases of infrabony defects. Combining this technique with the tetracycline root conditioning does not improve

the results in terms of pocket depths and defect resolution.

However, in sites where the tetracycline was applied there was a significant resolution in the pocket depths and defect area. Both the treatment procedures are technique sensitive and their success depends on various factors which include the type of defect, presence of recession, flap being sutured without tension and most importantly proper patient compliance. It is only when these factors are fulfilled that these techniques become predictable.

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