



Original Research Article

Effect of citric acid on periodontally involved root surface after mechanical debridement as root conditioning agent– A SEM study

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ABSTRACT

Periodontitis-affected root surfaces are hypermineralized and contaminated with cytotoxic and other biologically active substances. Chemical root conditioner are playing important role in decontaminating root surface as well as enlarge dentinal tubules into which healing connective tissue can enter. The various root conditioning agents used are citric acid, tetracycline, doxycycline, phosphoric acid, ethylene diamine tetra acetic acid etc. The present study was aimed to compare the efficacy of citric acid as root conditioner with scaling and root planing scaling and root planing alone by observing the change in root surface under SEM. For the present study 40 samples were obtained from 20 single rooted anterior teeth indicated for extraction having hopeless prognosis. The obtained samples are scaled and root planed properly then tooth root are divided in two parts and. One part of each root sample were treated with saline and other with citric acid. Scanning photomicrographs of the root surfaces were taken at 3000X. Photomicrography analysis of SEM samples revealed that removal of smear layer and opening of dentinal tubules was more in samples treated by citric acid with SRP than the SRP alone.

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1. Introduction

The primary etiological factor in periodontal disease is bacterial plaque. This results in an inflammatory lesion in the gingival tissues leading to progressive destruction of the supporting periodontal tissues. Periodontitis-affected root surfaces are hypermineralized and contaminated with cytotoxic and other biologically active substances. The ultimate goal of periodontal therapy is to obtained periodontal regeneration of the periodontium in the area of previously affected root surface. Scaling and root planing are the main treatment for decontaminate the root surface. However potential limitation of scaling and root planing is it does not remove endotoxins completely. Chemical root conditioner are playing important role in decontaminating root surface as well as enlarge dentinal tubules into

which healing connective tissue can enter. The various root conditioning agents used are citric acid, tetracycline, doxycycline, phosphoric acid, ethylene diamine tetra acetic acid, fibronectin, laminin etc.

2. Aims and Objective

The present study was aimed to compare the efficacy of citric acid as root conditioner with scaling and root planing scaling and root planing alone by observing the change in root surface under SEM.

2.1. Review of literature

It is one of the earliest chemical agents that has been used for root conditioning (Labahn et al 1992).¹ Citric acid demineralization enhances new attachment or reattachment and regeneration by one or more of the following mechanisms: antibacterial effect, exposure of

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root collagen, opening of dentinal tubules and removal of smear layer (Polson et al 1987),² demineralization prior to cementogenesis (Register et al 1975),³ no adverse effect to pulp or periodontal tissues, enhanced fibroblast growth (Boyko et al 1980).⁴

3. Materials and Methods

For the present study 20 single rooted anterior teeth indicated for extraction having hopeless prognosis due to advanced periodontitis were collected from OPD. The obtained teeth are scaled and root planed properly then tooth root are divided in two parts and 40 samples were obtained. One part of each root sample were treated with saline and other with citric acid. Scanning photomicrographs of the root surfaces were taken at 3000X. The specimen were examined for total number of patented tubules and percentage of patented tubules. Results were statistically analyzed.

4. Results

A highly significant differences (p value <0.0001) is observed in between the scores of SEM photomicrographs of Group SRP only and Group SRP with citric acid treatment.

The mean of group I SRP alone is 0.832 and group II SRP with root conditioning with citric acid is 1.706 which signifies that less number of patented dentinal tubule in group I while more number of patented dentinal tubules are seen in group II. The difference is highly significant

5. Discussion

Plaque is the main etiological factor periodontal disease, presence of bacterial plaque on the root surface affects periodontal regeneration by providing poor base for attachment and proliferation of fibroblasts. Various acids and chelating agents were tried for root surface bio modifications for effective periodontal regenerations. Citric acid as root conditioner has been used since many years, since its acidic pH it removes smear layer from partially demineralized scaled and root planed surfaces. It also does widening and opening of dental tubule as well as exposing various components of cementum extracellular matrix and dentin extracellular matrix. The study sample included twenty freshly extracted teeth. For the present study 40 sample from 20 single rooted anterior teeth indicated for extraction due to advanced chronic periodontitis have hopeless prognosis were selected that satisfied the inclusion and exclusion criteria of the study Following extraction, the teeth were thoroughly washed with distilled water and transported in the same. Meticulous root planing was then done with a Gracey Curette to obtain a smooth, shiny and hard surface. Specimens were obtained from the cervical 2/3rd of the roots. It contains less cementum as compared

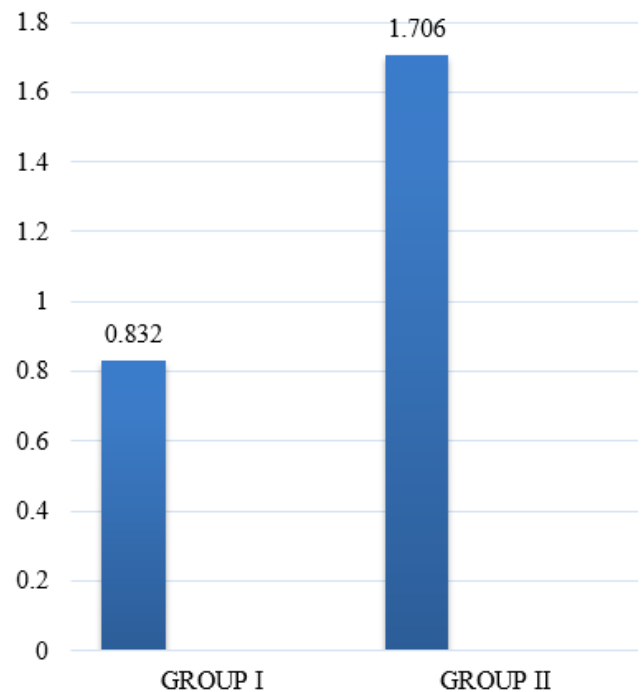


Fig. 1: Comparison of SEM photomicrographs score in Group I and Group II

to the apical third (Borghetti et al 1987)⁵ so it is easy to remove the cementum and obtain a glass like dentin surface for root conditioning. Instrumentation prior to application of root conditioning agents was done to remove the hypermineralized surface layer present on the periodontitis-affected roots (Trombelli et al 1995)⁶ and also to remove as much cementum as possible because root conditioning done on hypermineralized cemental surfaces does not induce collagen fiber attachment (Polson AM and Hanes PJ 1989);⁷ In the present study we used a supersaturated solution of citric acid (Shetty B 2008).⁸ Photomicrography analysis of SEM samples revealed that removal of smear layer and opening of dentinal tubules was more in samples treated by citric acid with SRP than the SRP alone.

6. Conclusion

Observation made from present study shows that citric acid is effective against removal of smear layer from root surface as well as uncovering and widening of dentinal tubule orifices. Hence use of citric acid with SRP on root surface might have a significant role in periodontal regeneration and new attachment.

7. Source of Funding

No financial support was received for the work within this manuscript.

Table 1: Comparison of no. of smear free dentinal tubule in per 100 μm^2 SEM Photo micrographs score in I SRP only and Group II SRP with citric acid treatment

Groups	N	Mean score	Standard deviation	Standard Error	Mean differences	t value	p value
Group I	20	0.832	0.48046	.10743	0.874	t= -5.6	<0.0001
Group II	20	1.706	0.50289	.11245			

8. Conflict of Interest

The authors declare they have no conflict of interest.

References

1. Labahn R, Fahrenbach WH, Clark SM, Lie T, Adams DF. Root Dentin Morphology After Different Modes of Citric Acid and Tetracycline Hydrochloride Conditioning. *J Periodontol.* 1992;63(4):303–9. doi:10.1902/jop.1992.63.4.303.
2. Polson AM, Ladenheim S, Hanes PJ. Cell and Fiber Attachment to Demineralized Dentin from Periodontitis-Affected Root Surfaces. *J Periodontol.* 1986;57(4):235–46. doi:10.1902/jop.1986.57.4.235.
3. Register AA. Bone and Cementum Induction by Dentin, Demineralized in situ. *J Periodontol.* 1973;44(1):49–54. doi:10.1902/jop.1973.44.1.49.
4. Boyko GA, Brunette DM, Melcher AH. Cell attachment to demineralized root surfaces in vitro. *J Periodontol Res.* 1980;15(3):297–303. doi:10.1111/j.1600-0765.1980.tb00285.x.
5. Borghetti A, Mattout P, Mattout C. How much root planning is necessary to remove the cementum from the root surface? *Int J Periodontics Restor Dent.* 1987;4:23–9.
6. Trombetti L, Scabbia A, Zangari F, Griselli A, Wikesjö UME, Calura G, et al. Effect of Tetracycline HCl on Periodontally-Affected Human Root Surfaces. *J Periodontol.* 1995;66(8):685–91. doi:10.1902/jop.1995.66.8.685.
7. Polson AM, Hanes PJ. Cell and fiber responses to cementum from periodontitis-affected root surfaces after citric acid treatment*. *J Clin Periodontol.* 1989;16(8):489–97. doi:10.1111/j.1600-051x.1989.tb02325.x.
8. Shetty B, Dinesh A, Seshan H. Comparative effects of tetracyclines and citric acid on dentin root surface of periodontally involved human teeth: A scanning electron microscope study. *J Indian soc Periodontol.* 2008;12(1):8–15. doi:10.4103/0972-124x.44090.

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