Subgingival Periodontal Pre-Treatment Irrigation with 0.75% Boric Acid as an Adjunct to Mechanical Periodontal Therapy in Localised Chronic Periodontitis

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ABSTRACT

Introduction: Dental plaque is the primary aetiological factor for periodontal disease. Scaling and root planing may fail to eliminate periodontal pathogenic species because of limited access to the root surface and tissue-invading properties of some periodontal pathogens. Considerable attention has been devoted to the possibility of using antimicrobial agents such as chlorhexidine to eliminate periodontal pathogens with limited success. Studies show that boric acid has antibacterial and anti-inflammatory properties.

Objective: The aim of the study was to evaluate the efficacy of 0.75% boric acid when used as a subgingival irrigation agent as an adjunct to oral prophylaxis in treatment of localised chronic periodontitis.

Methods: A total of 40 individuals who reported to the dental college with localised periodontitis (pocket depth of ≥ 6 mm) participated in the study. Plaque Index, Gingival Index and Probing Pocket Depth were recorded at baseline and one month post irrigation with either 0.75% boric acid (Group I) or 0.2% chlorhexidine (group II). Intragroup comparison was done using student "t" test.

Results: Intra-group comparison in Group I and Group II showed significant results for reduction in Plaque Index, Gingival Index and Probing Pocket Depth. Significant results observed for reduction of Probing Pocket Depth (<0.025) between the two groups - Plaque Index (>0.54) and Gingival Index (>0.93) were non-significant one month postoperatively.

Conclusion: The results of this study suggest that 0.75% boric acid has similar efficacy as 0.2% chlorhexidine as a coadjuvant in the treatment of periodontitis.

Keywords: Boric acid 0.75%; chlorhexidine 0.2%; periodontitis.

INTRODUCTION

Dental plaque is the primary aetiological factor for periodontal disease. Plaque control plays a significant role in eliminating pathogenic organisms. Scaling and root planing may fail to eliminate periodontal pathogenic species because of limited access to the root surface and tissue-invading properties of some periodontal pathogens.[1,2] Porphyromonas gingivalis, Treponema denticola, and Tannerella forsythia are present in greater numbers in subgingival plaque from patients with periodontitis compared with healthy individuals.[3] Considerable attention has been devoted to the possibility of using antimicrobial agents to eliminate periodontal pathogens. Antimicrobial agents like chlorhexidine, have been used with limited success in the treatment of periodontal disease.[4,5]

Chlorhexidine, which has often been used as an adjunct to mechanical therapy has a broad spectrum antimicrobial activity. However, clinical benefits on the subgingival microflora were shown to be limited.[6]

Boric acid [H3BO3-B(OH)3] is a colourless crystal/ white powder that dissolves in water. In mineral form, it is called sassolite. It has been used as an antiseptic, antibacterial, insecticide, flame retardant, neutron absorber, and precursor to other chemical compounds. A regulatory effect of boron in the inflammatory and immune response also has been demonstrated. Luan et al concluded that boric acid has antibacterial and anti-inflammatory properties.[7] It reduces the formation of an inflammatory infiltrate and bone loss in rats, measured histologically and by micro-computerised tomography.

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The objective of the present study was to evaluate the efficacy of 0.75% boric acid as an adjunct to mechanical plaque control in the treatment of localised chronic periodontitis.

METHODS

A total number of 40 subjects were included in the study in the age range of 30-60 years suffering from localised chronic periodontitis attending the outpatient department of Periodontology, Pacific Dental College and Hospital. Ethical approval was obtained from Pacific Dental College and Hospital, all subjects provided written informed consent before their enrollment into the study.

Systemically healthy subjects with minimum of 20 teeth present, who had Localised Periodontitis (Probing Pocket depth ≥6 mm) were included in the study. Periodontal treatment in the past 12 months, use of antibiotics or anti-inflammatory drugs in the past six months, pregnancy or use of oral contraceptives, smoking were excluded.

The following clinical parameters were recorded at baseline and after one month: i) Plaque Index (PI, Turesky-Gilmore-Glickman Modification of Quigley Hein Plaque Index);8 ii) Gingival Index (GI, Loe and Silness);9 iii) Probing Pocket Depth was measured using a William's graduated periodontal probe (Figure 3, 4).

Boric acid 0.75% irrigation has been used as adjunct to mechanical periodontal therapy in subjects with chronic periodontitis. Boric acid 0.75% concentration is non-toxic to human gingival fibroblasts and human periodontal ligament fibroblasts.10 So, it was decided to use 0.75% concentration of boric acid (pH 4.9) in our study. Boric acid powder 0.75 gm was measured by using analytic balance machine. Then 0.75 gm of boric acid was dissolved in 100 ml of distilled water. Before clinical application, the boric acid solutions were sterile filtered (0.22 µm) and dispensed in bottles (Figure 1). At the time of clinical use it was transferred to the water-pik irrigator (Dento India Pvt.Ltd, Figure 2).

Subjects were conveniently divided into 2 groups: Group I - 20 subjects underwent oral prophylaxis and were dispensed 10 ml of 0.75% Boric acid irrigation in the oral irrigator (water pik irrigator) into the periodontal pocket for five seconds; Group II - 20 subjects underwent oral prophylaxis and were dispensed 10 ml of 0.2% Chlorhexidine irrigation in the water pik irrigator into the periodontal pocket for five seconds. Subjects of both the groups were recalled after one month to evaluate the clinical parameters. Students 't' test was used for statistical analysis and p value was adjusted at $p>0.05$.

RESULTS

In Group I, the mean plaque index score at baseline was 2.13 ± 0.70 which reduced to 1.53 ± 0.50, one month postoperatively. The reduction in mean plaque index score was found to be significant ($p< 0.0$) In Group II, the mean Plaque index score at baseline was 2.24 ± 0.74 which reduced to 1.6 ± 0.35, one month postoperatively which was also found to be significant ($p< 0.02$, Table 1). Intergroup comparison showed non-significant differences in PI scores at baseline and 1 month post-therapy. (Table 2, 3, Figure 1)

The mean gingival index score in Group I at baseline was 1.19 ± 0.56 which reduced to 0.814 ± 0.22, one month postoperatively. On Intragroup comparison, the reduction in gingival index score between baseline and one month postoperatively was found to be significant ($p < 0.01$). In Group II, the mean gingival index score at baseline was 1.09 ± 0.58 which reduced to 0.80 ± 0.28 one month postoperatively. The reduction in gingival index score between baseline and 1 month post-operatively was found to be significant ($p < 0.006$, Table 1). On intergroup comparison gingival index score at baseline was non-significant ($p = 0.59$) and at one month postoperatively was found to be non-significant ($p=0.93$, Table 2, 3, Figure 2).

Table 1: Intragroup comparison of plaque index, gingival index, probing pocket depth at baseline and one month postoperatively.

Clinical parameters	Group I			Group II		
	Baseline	1 month Post op	p value	Baseline	1 month Post op	p value
Plaque index	2.13±0.70	1.53±0.50	0.01 (S)	2.24±0.74	1.62±0.35	0.02 (S)
Gingival index	1.19±0.56	0.814±0.22	0.01 (S)	1.09±0.58	0.80±0.28	0.006 (S)
Probing pocket depth(mm)	06	5.60±0.55	0.002(S)	06	5.25±0.44	0.01(S)

Table 2: Intergroup comparisons of plaque index, gingival index, probing pocket depth at baseline and one month.

Clinical parameters	Group I	Group II	p value
Plaque index	2.13±0.70	2.24±0.74	0.65 (NS)
Gingival index	1.19±0.56	1.09±0.58	0.59 (NS)
Probing pocket depth (mm)	06	06	0

Table 3: One month post-operatively between Group I and Group II.

Clinical parameters	Group I	Group II	p value
Plaque index	1.53±0.505	1.61±0.35	0.54(NS)
Gingival index	0.81±0.199	0.80±0.28	0.93(NS)
Probing pocket depth (mm)	5.60±0.55	5.25±0.44	0.025(S)

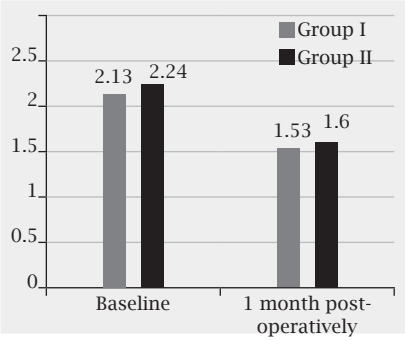


Figure 1: Plaque index.

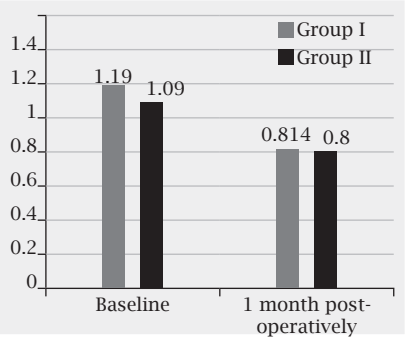


Figure 2: Gingival index.

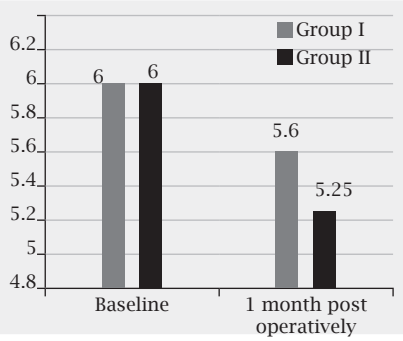
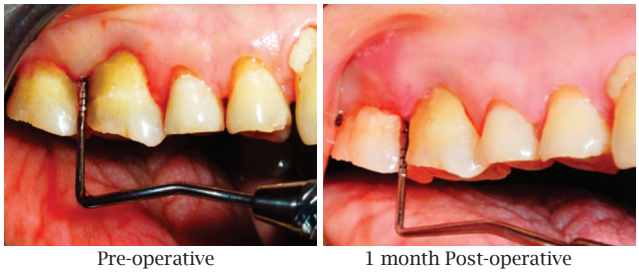


Figure 3: Probing pocket depth.

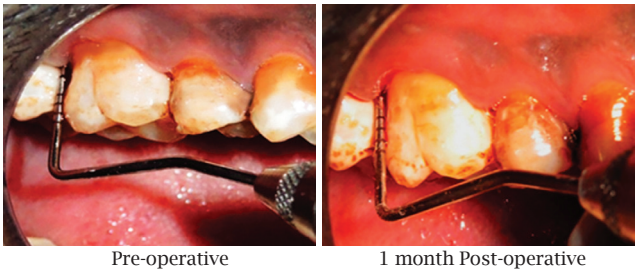
Figure 4: Boric acid 0.75% and chlorhexidine 0.2%.

Figure 5: Water-pik irrigator.



Pre-operative 1 month Post-operative

Figure 6: Group I - Probing pocket depth.



Pre-operative 1 month Post-operative

Figure 7: Group II - Probing pocket depth.

The mean probing pocket depth was 6 mm in both the group at baseline, which reduced to 5.60 mm ± 0.55 mm at the end of one month postoperatively in Group I. This reduction of probing pocket depth from baseline to one month was significant ($p< 0.002$). Whereas, in Group II it reduced to 5.25 mm ± 0.44 mm and reduction of probing pocket depth was significant from baseline to one month ($p<0.01$, Table 1). On intergroup comparison probing pocket depth at baseline was significant and 1 month postoperatively ($p< 0.025$) significant (Table 2,3, Figure 3).

DISCUSSION

Antimicrobial effect of boron has been reported by Benkovic et al.[10] Inflammatory and immune response has been also demonstrated by Luan et al.[7] In the present study, the effects of sub-gingival boric acid as an irrigation agent used as an adjunct to scaling and root planing in localised chronic periodontitis was evaluated. Ince et al reported that boric acid prevents oxidative damage by increasing an

antioxidant agent, glutathione, its analog and by promoting other neutralizing agents of reactive oxygen species.[11] In the present study there was a reduction in probing pocket depth from baseline to one month when 0.75% boric acid was used. However, Akalin et al also demonstrated in a study that Lipid Peroxidation Levels, Total Oxidant Status may play an important role in the pathology of periodontitis.[12] This situation may be the reason for reductions in probing pocket depth and clinical attachment level which were observed in both the groups. It has been suggested that boron may have a regulatory role in the inflammatory or immune response. Travers et al in boron supplement arthritis reported that substantial improvement was observed in subjective measures of joint swelling, restricted movement and fewer analgesics were used for relieving pain.[13] Saglam et al also reported in a study that the use of boric acid or chlorhexidine in periodontal pockets as an adjunct to non-surgical periodontal treatment produces a significant improvement in clinical parameters.[10] In the present study also the mean probing depth at baseline in both the groups was 6 mm. After one month, 1 mm reduction was recorded clinically in both the groups. On Intragroup comparison, boric acid shows significant reduction in probing depth. The reduction which occurs is due to the anti-inflammatory effect of boron. Plaque index and Gingival index also was seen to improve over a period of one month confirming with the study of Saglam et al they also observed significant reduction result in plaque index while using boric acid as an adjunct of scaling and root planing.[10]

In the present study a significant reduction was noticed in plaque index, gingival index and probing pocket depth with the use of chlorhexidine. Similar result was observed in a study conducted by Vignarajah et al.[14] The reduction in all parameters which occurs due to the anti-inflammatory effect of boron. In the present study follow-up period is a limitation. It seems that boric acid is effective in the early healing period. So further studies with longer follow-up periods are required to prove the efficacy of 0.75% boric acid as an adjunct to nonsurgical treatment.

CONCLUSION

The results of the present study suggest that 0.75% boric acid as a pocket irrigant has effect similar to that of 0.2% chlorhexidine in resolving periodontitis. Boric acid irrigation as an adjunct to non-surgical periodontal treatment seems to be a safe and effective in the treatment of patients with chronic localised periodontitis.

REFERENCES

1. Cobb CM. Clinical significance of non-surgical periodontal therapy: An evidence-based perspective of scaling and root planing. J Clin Periodontol. 2002;29:6-16.
2. Petersilka GJ, Ehmke B, Flemmig TF. Antimicrobial effects of mechanical debridement. Periodontol 2000. 2002;28:56-71.
3. Holt SC, Ebersole JL. Porphyromonas gingivalis, Treponema denticola, and Tannerella forsythia: The "red complex", a prototype polybacterial pathogenic consortium in periodontitis. Periodontol 2000. 2005;38:72-122.
4. Mariotti AJ, Rumpf DA. Chlorhexidine-induced changes to human gingival fibroblast collagen and non-collagen protein production. J Periodontol. 1999;70:1443-8.
5. Hoang T, Jorgensen MG, Keim RG, Pattison AM, Slots J. Povidone-iodine as a periodontal pocket disinfectant. J Periodontal Res. 2003;38:311-7.
6. Walker CB, Karpinia K, Baehni P. Chemotherapeutics: Antibiotics and other antimicrobials. Periodontol 2000. 2004;36:146-65.
7. Luan Q, Desta T, Chehab L, Sanders VJ, Plattner J, Graves DT. Inhibition of experimental periodontitis by a topical boron-based antimicrobial. J Dent Res. 2008;87:148-52.
8. Turesky S, Gilmore N, Glickman I. Reduced plaque formation by chloromethyl analogue of vitamin C. J Periodontol. 1970;41:41-3.
9. Loe H. The gingival index, the plaque index and the retention index systems. J Periodontol. 1967;38:610-6.
10. Ince S, Kucukkurt I, Cigerci IH, Fidan AF, Eryavuz A. The effects of dietary boric acid and borax supplementation on lipid peroxidation, antioxidant activity, and DNA damage in rats. J Trace Elem Med Biol. 2010;24:161-4.
11. Akalin FA, Baltacioglu E, Alver A, Karabulut E. Lipid peroxidation levels and total oxidant status in serum, saliva and gingival crevicular fluid in patients withchronic periodontitis. J Clin Periodontol. 2007;34:558-65
12. Travers RL, Rennie GC, Newnham RE. Boron and arthritis: The results of a double-blind pilot study. J Nutr Med. 1990;1:127-132.
13. Saglam M, Arslan U, Buket BS, Hakki SS. Boric acid irrigation as an adjunct to mechanical periodontal therapy in patients with chronic periodontitis: a randomized clinical trial. J Periodontol. 2013;84:1297-308.
14. Vignarajah S, Newman HN, Bulman J. Pulsated jet subgingival irrigation with 0.1% chlorhexidine, simplified oral hygiene and chronic periodontitis. J Clin Periodontol. 1989;16:365-70.