



EVALUATION OF THE EFFECTIVENESS OF CHLORHEXIDINE MOUTHWASH ENRICHED WITH HYALURONIC ACID: A RANDOMIZED CLINICAL TRIAL

Periodontology

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ABSTRACT

Introduction: Hyaluronic acid is known to have anti-inflammatory, bacteriostatic, antioxidant and antibacterial action by inhibiting the growth and attachment of various microorganisms. **OBJECTIVE:** To evaluate the efficacy of chlorhexidine mouthwash enriched with hyaluronic acid and chlorhexidine mouthwash alone in subjects with mild to moderate gingivitis at baseline, 7 days and 21 days. **Methodology:** A randomized controlled trial was conducted in 20 participants diagnosed with plaque induced gingivitis. Subjects were randomly allocated to the test group and control group and assessed at three time points over the course of the study by the same operator. The follow-up of the patients were done after 7 days and 21 days and clinical parameters evaluated through plaque Index, gingival Index, and wound healing index. **Results:** It was found that CHX mouthwash enriched with hyaluronic acid was more effective in maintaining gingival health as compared to CHX mouthwash alone. Plaque index, gingival index and wound healing index showed statistical difference when compared with the control group (p value less than 0.05). **Conclusion:** This study concludes that chlorhexidine mouthwash enriched with hyaluronic acid is more effective in reducing plaque induced gingivitis.

KEYWORDS

Hyaluronic acid mouthwash, Plaque induced gingivitis, Wound healing index, Chlorhexidine.

INTRODUCTION

Gingivitis is an inflammatory condition of the gingiva that clinically manifests with bleeding, gingival hypertrophy, erythema or oedema of the affected tissues, but does not involve loss of supporting tissue of the tooth. Gingivitis is a reversible condition but, if not properly treated and in susceptible subjects, it can develop into periodontitis. Prevention can be achieved through the control of its causative agent, bacterial plaque. (Chapple et al., 2018). Its most common form is caused by bacteria in association with the presence of plaque. Other risk factors include poor dental hygiene, smoking as well as metabolic, nutritional, and genetic factors (Lindhe & Lang, 2015).

Treatment of gingivitis can be accomplished through control of the supragingival plaque. Scaling and polishing significantly reduces plaque levels and gingival inflammation. Regarding home treatment, motivation and instruction of patients are fundamental in order to learn how to correctly use toothbrush and interdental hygiene instruments. Antiplaque agents in the form of mouthwashes are useful in association with conventional tooth brushing (Chapple et al., 2015). Chlorhexidine is the considered as the gold standard for chemical plaque control, but it has side effects. HA has been proved to be effective in inhibiting plaque growth in an in vivo study, similar to chlorhexidine (Rodrigues et al., 2010). It not only helps in protecting the oral mucosa but also allows retention of other actives at the site of action to prolong their effect. In addition, HA in combination with cetylpyridinium chloride resulted to be as effective as chlorhexidine in preventing plaque (Tadakamadla et al., 2019). It also seems to be effective in reducing the inflammatory response if used as an adjunct to nonsurgical and surgical periodontal therapies. (Bertl et al., 2015; Eliezer et al., 2019).

HA is a glycosaminoglycan and one of the main components of the extracellular matrix, it can be found in different tissues such as skin, cartilage, synovial fluid, tendons, eyes, and has an important role in tissue repair processes, modulates cell-cell and cell-matrix interactions, tissue hydration and angiogenesis. It also promotes the development of granulation tissue and stimulates cell proliferation, migration and differentiation (Chen & Abatangelo, 1999; Dechert et al., 2006).

This study evaluated and compared the efficacy of the chlorhexidine mouthwash enriched with hyaluronic acid and chlorhexidine mouthwash alone in gingivitis subjects.

Study Design And Population:

This was an experimental study (randomized clinical control) over 21 days with random allocation of participants into two groups. Ethics approval was granted by the institutional ethics committee of Y. M. T Dental college and Hospital, Kharghar, Navi Mumbai.

A sample size of 20 (10 in each group) was calculated using G*Power statistics software (Version 3.0) to be adequate with a type I error of 5% and power of 80% assuming an effect size of 1.39.

Study participants were consecutively selected from the outpatient department visiting the department of Periodontology according to defined inclusion and exclusion criteria.

Inclusion Criteria: Study participants older than 18 years old and below 50 years. Systemically healthy and cooperative with plaque induced mild to moderate gingivitis. Participants willing to provide informed consent, were considered for inclusion.

Exclusion Criteria: Participants suffering from any systemic conditions such as diabetes mellitus, hypertension, hepatitis, HIV, acute and/or chronic infectious pathologies as well as those using topical or systemic drugs, smokers or with history of antibiotic and/or anti-inflammatory drugs within one month. Participants unable to follow hygiene instructions, using any orthodontic appliances or any fixed or removable dentures. Participants who had undergone any periodontal therapy in past six months.

Patients received an information sheet describing the protocol and those interested provided a written consent. All eligible participants were subsequently equally randomized into group A and group B.

Randomization And Allocation Concealment:

This was a triple blinded clinical trial i.e. participants, examiner and data analyst were blinded. The products were packaged in such a way that they were not recognizable either by the operator or by the patient. Each package was in turn assigned a number that referred to the type of the product. The association between the number and the type of the product was collected by another operator, not related to the data collection. The data collected was entered into a database in order to carry out the statistical analysis.

Clinical Evaluation: The enrolled participants were examined at baseline and scaling and polishing, was performed by single periodontist. Study participants were then given the test or control product to be used twice a day 30 min after tooth brushing. They were instructed to rinse with 10 ml for 30 seconds and were advised to not drink or eat for 30 min after rinsing. On day 7 and day 21 at the follow up visits, the outcomes of the study were assessed through three different indices.

A modified SILNESS AND LOE PLAQUE INDEX (PI) was used to evaluate the level of plaque formation (Silness & Loe, 1964). Gingival inflammation with modified version of LOE AND SILNESS GINGIVAL INDEX (GI), (Løe and silness, 1967). Wound healing

index was used to evaluate the parameters of tissue colour, bleeding response to palpation, margins, and the presence of suppuration (Landry et al 1988).

Statistical Analysis: Statistical analysis was carried out. The tests used were independent t-test for intergroup comparison. Estimated mean and SE were reported. Statistical significance level was set less than or equal to 0.05.

RESULTS:

Twenty patients participated and completed follow up examination. Demographics of participants summarize in table no. 1

Table–1

Gender	Test group n=10	Control group n=10
Male	7	7
Mean ± SD	29.5 ± 7.2	34±9.1
Age range	23-45	23-48
female	3	3
Mean ± SD	26.6 ± 2.5	27.3±3.5
Age range	24-29	24-31

Table–2

Index	Groups	Baseline	Follow ups		Comparisons between follow ups		
			Day 7	Day 21	p value baseline vs day 7	p value baseline vs day 21	p value day 7 vs day 21
Plaque index	Group A	0.99 ± 0.20	0.57 ± 0.24	0.54 ± 0.22	0.074	0.007*	0.58
	Group B	0.95 ± 0.32	0.59 ± 0.18	0.62 ± 0.29	0.45	0.39	0.82
Gingival index	Group A	0.64 ± 0.25	0.44 ± 0.21	0.45 ± 0.21	0.11	0.007*	0.22
	Group B	0.62 ± 0.29	0.40 ± 0.20	0.39 ± 0.21	0.24	0.16	0.17
Wound healing index	Group A	1.5 ± 0.5	2 ± 0.44	3 ± 0.77	0.1	0.007*	0.007*
	Group B	1.7 ± 0.45	1.8 ± 0.6	2.5 ± 0.5	0.08	0.17	0.45

p value less than or equal to 0.05 considered as statistically significant. Significance (p-value) for differences between group A and group B and between times tested by Wilcoxon's tests and Fisher's exact test. Post hoc estimated effects on sample size (p=0.05 with 0.90 power) and post hoc power analysis were also calculated. Plaque index, gingival index at baseline vs day 21 showed statistically significant (p value < 0.05) reduction in group A, wound healing index at baseline vs day 21 and at day 7 vs day 21 was statistically significant (p value < 0.05) in group A.

DISCUSSION:

The aim of this study was to evaluate and compare the efficacy of chlorhexidine mouthwash enriched with hyaluronic acid with chlorhexidine mouthwash alone in gingivitis subjects. HA group showed better results with reference to PI, GI and wound healing index.

Binshabaib, M Aabed, K., Alotaibi F et al (2019) conducted in vitro study in which the biofilms were divided into 3 groups as follows: (a) negative group; (b) 0.8% HA group and (c) 0.2% CHX. They concluded that 0.8% HA is more effective in reducing the P. gingivalis CFUs/ml when compared with 0.2% CHX.

Detailed instructions for routine oral hygiene procedures were provided by the operator at baseline which would have led to an adequate mechanical action of tooth brushing. This could be demonstrated through low scores of plaque and gingivitis at follow up even in the control group, thus indicating optimal levels of oral hygiene of the patients.

It has been confirmed that HA is involved in different stages of wound healing according to their individual roles. High molecular weight (HMW) HA at the inflammation stage is aggressively decomposed into oligomers of low molecular weight (LMW) HA, which in turn promotes leukocyte chemotaxis and expression of inflammatory cytokines like IL-1 β , TNF- α and IGF-1. HMW HA displays anti-angiogenic and anti-inflammatory properties, whereas LMW HA (<1000 kDa) acts oppositely, being pro-inflammatory and pro-

angiogenic. LMW HA by-products of HA degradation have key impact on healing, driving angiogenesis in the wound. HA oligosaccharides trigger angiogenesis through endothelial cell proliferation through binding to HA receptors, such as CD44 these findings were confirmed by the results of the higher wound healing index.

Gontiya et al. demonstrated that subgingivally applying 0.2% HA gel with SRP in chronic periodontitis patients improved the gingival index and bleeding index when compared to control sites, which was confirmed by a gingival biopsy, which revealed a significant reduction in inflammatory markers.

In this clinical study on plaque induced gingivitis, decreased plaque scores, bleeding on probing and gingival inflammation was observed. Additionally, HA mouthwash positively influenced wound healing.

Limitations:

The sample size of this study was small, further studies with larger sample size should be conducted. Additionally, microbial assessment was not conducted.

CONCLUSION:

Both chlorhexidine mouthwash and chlorhexidine mouthwash enriched with hyaluronic acid are effective in reducing the plaque scores, bleeding on probing. HA enriched mouthwash showed better healing than 0.2% chlorhexidine mouthwash alone. However, RCTs with larger sample size are needed to assess the clinical efficacy of chlorhexidine mouthwash enriched with hyaluronic acid in treatment of gingivitis and periodontitis.

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Conflict Of Interest: The authors declare no conflict of interest.

Data Availability Statements: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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