

Comparative Evaluation of Co-Enzyme Q10 and Chlorhexidine Mouthwash in the Treatment of Gingivitis. A Randomized Controlled Clinical Trial

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Abstract

Aim: This study aims to evaluate the anti-gingivitis effect of Co enzyme Q10 as a mouthwash with chlorhexidine mouthwash.

Materials and Methods: Forty patients were enrolled in the double blinded randomized controlled trial wherein 20 patients were allocated in test group and 20 patients in control group. For each patient scaling was performed and Coenzyme Q10 mouthwash given in test group and Chlorhexidine mouthwash given in control group and plaque index(PI), gingival index(GI) and bleeding index(BI) scores were recorded at baseline, 15 days and 30 days.

Results: Marked reductions of Plaque index, gingival index, and Bleeding Index were observed after 30 days in both groups. But the difference that was observed in both groups after 30 days did not appear to be statistically significant.

Conclusion: It can be concluded from the current study that Coenzyme Q10 has potential for reducing the gingival inflammation, when used in the form of mouthwash with no side-effects evident in any of the patients. Therefore, future studies are required for testing the antiplaque and anti-gingivitis efficacy of Co enzyme Q10.

Keywords: Co enzyme Q10, Anti gingivitis, Antioxidant, Chlorhexidine

Introduction

Gingivitis has been affecting the mankind since ages and is well established through various models and experimental studies. Plaque which is the primary etiological factor for gingivitis is an adherent intercellular matrix attached to the tooth surfaces and dental prostheses (6). Although plaque control can be achieved by mechanical and chemical measures, mechanical plaque control is the gold standard for effective way of treating and preventing gingivitis and periodontitis and is the predictive factor in determining the overall prognosis of the treatment(6). Mechanical along with chemical plaque control is one of the key factors in achieving healthy periodontium to achieve plaque free state. For this to be achieved, along with the universally acceptable method of tooth brushing , usage of mouthwash is advisable and mandatory.

Although many chemical plaque control agents are available over the counter and the chlorhexidine is one amongst them which is considered as the gold standard agent due to its substantivity and its action against different kinds of bacteria, fungi and viruses, despite its adverse effects such as change in tooth color, mucosal desquamation, irritation, dryness of mouth and systemic effects as the result of swallowing(7,11).

Periodontal disease results in destruction of supporting tissues which is thought to be the result of loss of haemostatic balance between reactive oxygen species (ROS) and antioxidant defense system. Periodontal pathogens can induce ROS overproduction and thus may cause collagen and periodontal cell breakdown. When ROS are scavenged by antioxidants, there can be a reduction of collagen degradation(4). Ubiquinol that is reduced and active form of Co enzyme Q10 plays a key role in both in the mitochondrial electron transport chain and in the antioxidant response and also serves as endogenous antioxidant which increases the concentration of CoQ10 in the diseased gingiva thereby effectively suppressing the advanced periodontal inflammation (12).

Coenzyme Q10 which was discovered by Crane and his colleagues in 1957 was first isolated from the mitochondria of bovine hearts at the University of Wisconsin. Because of its ubiquitous presence in nature and its quinone structure Coenzyme Q10 is also known as ubiquinone(23). Co enzyme Q10 is a fat-soluble compound and an effective anti-oxidant naturally found in every cell of the human body, which is similar to that of the vitamin K. Its deficiency was found in human gingiva, leading to periodontal destruction and also has a

potential to disturb the systemically health causing gastrointestinal disturbances, reducing the blood pressure and causing allergic skin rashes in some people. Effect of CoQ10 on the oxidative metabolism in gingiva of periodontitis patients suggested that the administration of CoQ10 improves oxygen utilization in the gingival tissue. Thus the use of Coenzyme Q10 has shown a probable improvement in the health of gingiva.(8,15). Although Coenzyme Q10 had been tested as local drug delivery, gel and dentifrice, its effect as a mouthwash has not been reported in the literature so far.

Hence this study, which is the first of its kind, aims to evaluate the efficacy of Coenzyme Q10 in the form of mouthwash in treatment of gingivitis.

Materials and Methods

This study is a double blind, parallel, randomized controlled clinical trial done for a period of one month wherein a total of 40 systemically healthy patients with mild to moderate gingivitis were selected. The participants are divided in 2 different groups. The study was approved and ethical clearance was obtained from the Institutional ethical committee with Ref No: VDC/IEC/fac/2019/14 and also approved under Clinical Trials Registry India (CTRI/2020/07/026806). This study was performed in compliance with the Declaration of Helsinki.

The Inclusion criteria for participants were as follows: Age group of 18-50 years with mild to moderate gingivitis, with a minimum of 20 teeth and those who have not undergone periodontal treatment in past 6 months. Patients under anticoagulation medication, antibiotic therapy from past 1 month, smokers, pregnant and lactating women were excluded. The patients enrolled in the study were divided into two groups

Group A: Co-enzyme Q10 mouthwash (GUM activital, CoQ10)TM

Group B: Chlorhexidine mouthwash(Rexidine)TM

Informed consent was obtained from all the participants. All the patients had undergone complete intra oral examination. Oral prophylaxis was done with ultrasonic scaling. Patients of all groups were instructed to brush twice daily and instructed to rinse their mouth with 10 ml of respective mouthwash twice daily for 30 days along their regular oral hygiene maintenance.

Outcomes:

Examination included the assessment of plaque index scores, gingival index scores and bleeding index scores (2,3) that were recorded on 1st day, 15th day & 30th day respectively. Statistical analysis was done and a sample size of 40 was determined. 40 patients enrolled in the study were divided into two groups by using computer assisted research randomizer. Two types of mouthwashes were placed in the same type of containers and named as “A” & “B” respectively and were given to the patients who visited Department of Periodontics, Vishnu dental college which were randomly allocated into the 2 groups. Both the principal investigator and participants were blinded in the intervention.

Statistical analysis

The mean and standard deviation were calculated for the clinical parameters (PI, GI and BI) of the test and control groups. Intragroup comparison was done using Wilcoxon signed Ranks Test while intergroup comparison was done using Mann-Whitney Test. The level of significance was ≤ 0.05 at 95% confidence interval. The SPSS 17 software was used to perform the data analysis.

Results

Plaque index

At baseline, plaque index values for the group A and B were 1.29 ± 0.12 and 1.38 ± 0.13 , respectively. There was no significant difference between the two groups observed at baseline. After 1 month, group A showed statistically significant decrease in plaque index scores from 1.29 ± 0.12 to 0.76 ± 0.35 . Group B also showed statistically significant decrease in the plaque index scores from 1.38 ± 0.13 to 0.94 ± 0.26 . However, there is no statistical significant difference (p value – 0.542) between the two groups. (table-1)

Gingival index

At baseline, gingival index values for the group A were 1.28 ± 0.16 and group B were 1.38 ± 0.13 . There was no significant difference between the two groups at the baseline. After 1 month, Group A gingival index scores were reduced to 1.28 ± 0.16 to 0.67 ± 0.36 . Group B also showed a statistically significant decrease from 1.38 ± 0.13 to 0.75 ± 0.38 which was statistically

significant. However difference between both the groups was not statistically significant. (p value- 0.882)

Bleeding index

Bleeding index scores in both the groups at baseline, were 1.54 ± 0.26 and 1.73 ± 0.27 respectively. There was no significant difference between the two groups at the baseline. After 1 month, the bleeding scores reduced from 1.54 ± 0.26 to 1.03 ± 0.29 ($p \leq 0.001$) (Table -2). Group B also showed a statistically significant decrease in the bleeding index values from 1.73 ± 0.27 to 1.05 ± 0.35 . However the difference between both the groups was not statistically significant. (p value- 0.083)

Discussion

The microflora of the plaque is extremely complex causing problems in establishing which organisms are responsible for tissue destruction associated with the disease.(1) Many studies have demonstrated that microbial flora is the primary etiology in disease causation that initiates and aggravates the host response resulting in destruction. Periodontal therapy is not only directed towards microbial reduction but also towards host response modulation. Along with various treatment modalities in periodontal diseases, host modulation is being practiced for arresting periodontal diseases since past decades.

The reactive oxygen species and antioxidants are in a dynamic equilibrium in normal physiology. Whenever there is a shift in the equilibrium either by an increased ROS release or activity or by a diminished antioxidant defense mechanism, oxidative stress results. Periodontal tissues require adequate levels of antioxidants to prevent tissue damage caused by reactive oxygen species. (4) The use of antioxidants in treatment of periodontal disease and periodontal health has gained importance in recent studies. Antioxidants are compounds that scavenge the free radicals and prevent the initiation or progression of oxidation reactions by trapping oxygen in the environment. They play an important role in preserving the structural integrity of cells and tissues, by maintaining their normal functions and ensuring the maintenance of balance between oxidant and antioxidant mechanisms and can be used locally or systemically.(8),(15) They are present normally in our body but can also be supplemented in cases of excessive free radical production. Many agents like carotenoids, flavonoids, phenols, glutathione, vitamins like A, C

and E, and coenzyme Q 10 dietary supplements have been used. In this regard Coenzyme Q 10 is a newer agent that functions as an antioxidant, inhibiting lipid peroxidation and scavenging free radicals.(5),(14) Finally, it plays an important role in membrane stabilization and fluidity. The well-recognized function of coenzyme Q10 is mitochondrial energy coupling which plays a important role in the ATP synthesis and cellular respiration.(12),(20)

The deficiency of coenzyme Q10 at its enzyme sites was observed in gingival tissue that may exist independent of periodontal disease. Scaling and root planing along with oral hygiene measures could correct the microbial cause, but not that part of deficiency of CoQ10 due to systemic cause. (21,22) Therefore therapy with CoQ10 can be included with the oral hygiene for improved treatment of this type of periodontal disease.

The purpose of this study is to compare Coenzyme Q10 mouthwash with Chlorhexidine mouthwash to evaluate the effects on gingival health. Although impeccable studies do exist in the literature on the chlorhexidine mouthwash which is the gold standard since many years our study is one of the first of its kind in evaluating the effect of CoQ10 as a mouthwash.

Chlorhexidine mouthwashes have proven effects on anti-plaque, antiseptic and anti-gingivitis properties.(6),(7),(11),(16) In a clinical study conducted by Kale et al.(16) comparing the effect of 0.1% Chlorine Dioxide Mouthwash and 0.2% Chlorhexidine Mouthwash, both mouthwashes inhibited plaque formation up to 7 days, but after 14 days Chlorine dioxide mouthwash was found to be a less effective one in inhibiting plaque than chlorhexidine. It was concluded that chlorhexidine has better antibacterial efficacy in comparison to chlorine dioxide mouthwash.

Also chlorhexidine is considered as the gold standard because of its substantivity property. A study conducted comparing the indigenous herbal mouthwash with 0.2% chlorhexidine gluconate mouthwash by Khobragade et al.(17) reported that chlorhexidine mouthwash was efficacious at the 21st day in controlling plaque and gingivitis with potent antimicrobial activity.

Babushet al.(9)A study was conducted to evaluate efficacy of CoQ10 toothpaste in reducing mild to moderate gingivitis. A total of 30 patients were taken and divided into the

experimental and control group. It was concluded that patients using CoQ10 toothpaste significantly reduced moderate gingivitis.

In a split mouth study conducted by Hans et al.(10)CoQ10 gel was applied in periodontal sites treated by SRP and reported a highly significant improvement of all periodontal clinical parameters. This finding is similar to the clinical outcomes in our study with beneficial effects exhibited by Co enzyme Q10 mouthwash.

Coenzyme Q10 is recommended as a supplement to traditional therapy and oral supplements of CoQ10 have also been used as an adjunctive to periodontal therapy. A study conducted by Manthena et al.(19) where Coenzyme Q10 oral supplements were used as an adjunct to scaling and root planning. A significant reduction in gingival inflammation was evident when compared to scaling and root planing alone. Another study conducted by Saini et al.(13) reported that patients treated with SRP and dietary supplement of CoQ10 showed a significant reduction to all periodontal clinical parameters compared to patients treated by SRP only.

Recent study conducted by Pranam et al.(18)compared the efficacy of CoQ10 as an adjunct to NSPT and its effect on superoxide dismutase(SOD) in GCF and concluded that adjunctive use of CoQ10 with SRP can increase the antioxidant concentration.

CoQ10 exhibits anti-inflammatory, anti-oxidant and immunomodulatory properties. Although CoQ10 exhibits various favorable properties its use has been restricted in the form of oral supplements and local drug delivery agents in adjunct to scaling and root planing. Although, the studies have evaluated the effect of CoQ10 in the form of dentrifice and gel no studies evaluated the effect of Co q10 in the form of mouthwash along with conventional therapy. As there is no statistical significant difference in any of the indices between the two groups it can be put-forth that both the mouthwashes are equally effective.

Conclusion

As the effect of Coenzyme Q10 has been emphasized in the literature on its beneficial effects over the gingival tissues, Coenzyme Q10 can very well be advocated in the treatment of gingivitis. However further studies with larger sample size are necessary to evaluate the efficacy of Coenzyme Q10 mouthwash to substantiate its role as an anti-plaque and anti-gingivitis agent.

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Table 1: Intra Group comparison

Group A	N	Mean	Standard Deviation	p value
Pq I baseline	20	1.2960	0.12613	0.00
Pq I one month		0.7615	0.35022	
GI baseline	20	1.2800	0.16319	0.00
GI one month		0.6740	0.36155	
BI baseline	20	1.5448	0.26203	0.00
BI one month		1.0321	0.29548	
Group B	N	Mean	Standard Deviation	p value
Pq I baseline	20	1.3890	0.13560	0.00
Pq I one month		0.9495	0.26331	
GI baseline	20	1.3860	0.21045	0.00
GI one month		0.7520	0.38125	
BI baseline	20	1.7320	0.27426	0.00
BI one month		1.0540	0.35924	

PqI- Plaque Index, GI - Gingival Index, BI - Bleeding Index, n- Number of samples, $p \leq 0.005$

Table 2 :- Inter group comparison

		Group	N	Mean	Standard Deviation	p value
Plaque index		Control	20	0.4395	0.26124	0.542
		Test	20	0.5345	0.37004	
Gingival index		Control	20	0.6340	0.39031	0.882
		Test	20	0.6060	0.37637	
Bleeding index		Control	20	0.6780	0.25308	0.083
		Test	20	0.5127	0.23306	

N- Number of samples, $p \leq 0.005$.