Original Article

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Dentisry Section

Effectiveness of CoQ10 Oral Supplements as an Adjunct to Scaling and Root Planing in Improving Periodontal Health

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ABSTRACT

Introduction: Deficiency of CoQ 10 was found in human inflamed gingiva and has been found to be responsible for periodontal destruction.

Aim: To evaluate the effectiveness of CoQ 10 supplementation as an adjunct to scaling and rootplaning in reducing gingival inflammation and periodontal pocket depth.

Materials and Methods: The study was a randomized, double-blind, controlled, parallel group design clinical trial. Thirty subjects with plaque induced gingival inflammation and having atleast three nonadjacent interproximal sites with a probing pocket depth ≥ 5mm were included in the study. The subjects were randomly divided into two groups. The test group (n=15) in which patients were given oral CoQ10 supplements after scaling and root planing and the control group (n=15) in which patients were given an oral placebo after scaling and rootplaning. The plaque index, gingival index and probing depth were recorded at baseline, 1 month and 3 months. Statistical analysis done by using Student's paired *t*-test for intragroup comparison and unpaired *t*-test for inter-group comparison.

Results: Both the groups showed marked reduction of afore mentioned periodontal parameters at one month and three months when compared to baseline. Though there was no significant difference in plaque index and probing pocket depth between the two groups at any given time period, test group showed significant difference in gingival inflammation at one month and three months when compared to control group.

Conclusion: In the present study use of Coenzyme Q10 oral supplements as an adjunct to scaling and root planing showed significant reduction in gingival inflammation when compared to scaling and rootplaning alone.

Keywords: Antioxidants, Gingival inflammation, Periodontitis

INTRODUCTION

Gingivitis and periodontitis are oral inflammatory conditions of infectious nature. Gingivitis is a reversible inflammatory reaction of marginal gingival to plaque accumulation, where as periodontitis is a destructive, non reversible condition resulting in loss of tooth connective tissue attachment to bone which ultimately leads to loss of the involved teeth.

Several studies have shown that periodontitis is caused by products of immune response stimulated by microbial plaque around the gingival margin [1,2]. While polymorphonuclear leukocytes act as the primary mediator of the host response in the pathogenesis of periodontitis they may also contribute to periodontal tissue destruction through the release of proteolytic enzymes and reactive oxygen species (ROS) [3]. There is suggestive evidence indicating that periodontal inflammation might be associated with systemic oxidative stress [4,5].

Sies defined oxidative stress as a disturbance in the pro-oxidant and antioxidant balance in favour of the former, leading to potential damage [6]. Antioxidants are those substances which when present at low concentrations compared to those of oxidizable substrate, will significantly delay or inhibit oxidation of that substrate [7].

Co enzyme Q10 (CoQ10) is an antioxidant that exists in an oxidized form (ubiquinone or CoQ) and a reduced form (ubiquinol or $CoQH_2$). Battino et al., reviewed the role of CoQ10 as an important antioxidant in free radical mediated neurodegenerative diseases [8]. Littaru and Henson have demonstrated the deficiency of CoQ10 in the gingival tissues of periodontitis subjects [9,10]. But currently there are very few interventional studies in human periodontitis to substantiate clinical therapeutic benefit of CoQ10. Hence, the present study was designed to evaluate the effect of Coenzyme Q10 supplementation as an adjunct to mechanical periodontal therapy.

MATERIALS AND METHODS

The study was a randomized, double-blind, controlled, parallel group design clinical trial. The study protocol was approved by the Ethics Committee. The study was a single center study conducted in Department of Periodontics at our institution 2013, Drs. Sudha and Nageswara rao Siddhartha Institute of Dental Sciences, Chinnoutpalli, India. A total of 30 patients (14 female and 16 male) aged between 18 and 35 years, non smokers, systemically healthy individuals with a plaque index score of ≥2 (PI; Silness and Loe,1964) [6] and Gingival index (GI; Loe and Silness,1963) [6] score of ≥ 2, with atleast three non adjacent interproximal sites having a probing pocket depth ≥ 5mm were enrolled into the study. Exclusion criteria included, patients who had received any antibiotics and anti-inflammatory drugs within the duration of the study, smokers, pregnant and lactating mothers, patients with missing teeth. After all the subjects have been identified they were assigned into blocks (co-variates), then simple randomization was performed within each block to assign subjects to one of the treatment groups using a random number table by the statistician. The test group (n=15) in which patients were given oral CoQ10 (Qute 120 mg by Yash Pharma international) supplements after scaling and root planing and the control group (n=15) in which patients were given an oral placebo after scaling and root planing.

Procedure

All the subjects underwent scaling and root planing procedure at the first visit. Patients were also given proper oral hygiene instructions including conventional (scrub) brushing technique with a tooth paste and tooth brush (provided to the patient), twice daily during the study period. Patients were asked to take their respective oral supplements daily once till three months and were asked not to use any mouthwash. The plaque index, gingival index and the probing

depth were measured at one month and three months after the therapy.

STATISTICAL ANALYSIS

The mean and standard deviation were calculated for the clinical parameters (PI, GI and PD) of the test and control groups. Intragroup comparison was done using Student's paired *t*-test, while inter-group comparison was done using Student's unpaired *t*-test. The level of significance was ≤ 0.05 at 95% confidence interval. The SPSS 17 software was used to perform the data analysis.

RESULTS

Demographic and baseline clinical parameters were similar across both the study groups [Table/Fig-1]. The average age of the test group was 30.05±11 years and of the control group was 37.6±13.63 years. The age difference between the two groups was statistically not significant.

At Day 0 (baseline), the scores for GI, PI, and PD, were also comparable between the study groups. The differences were not statistically significant (p>0.05) [Table/Fig-1]. Thus, the similarities in patient selection enabled paired comparisons to be made between the two groups.

Clinical Parameters

The scores for PI at Day 0 (baseline) were similar between the test group (2.46±0.28) and the control group (2.52±0.25). The differences were not significant statistically (p=0.55). There was a highly significant (< 0.001) reduction in the PI scores from the baseline in the test group (0.36±0.10 and 0.50±0.11) and the control group (0.41±0.10 and 0.57±0.08) at one month and three months, respectively. In comparison, the PI scores between the test and control groups at one month (p=0.26) and three months (p=0.058) were not statistically significant [Table/Fig-2].

The scores for GI at Day 0 (baseline) were similar between the test group (2.60±0.31) and the control group (2.67±0.22) with p=0.49. Both the test group (0.17±0.07 and 0.25±0.12,) and control group (0.31±0.12 and 0.49±0.10) showed a significant (< 0.001) reduction in the GI scores from the baseline, after one month and three months respectively. In comparison, the GI scores between the test and control groups at one month (p=0.001) and three months (< 0.001) were statistically significant [Table/Fig-3].

The scores for PD at Day 0 (baseline) were similar between the test group (6.6±0.73) and the control group (6.7±0.53) with p=0.57. Both the test group (5.36±0.58 and 4.86±0.58,) and control group (5.6±0.54 and 4.9±0.56) showed a significant (< 0.001) reduction in the GI scores from the baseline, after one month and three months respectively. In comparison, the PD scores between the test and control groups at one month (p=0.26) and three months (p=0.75) were not statistically significant [Table/Fig-4].

Within the groups, statistical significance was observed for PI, GI, PD from baseline to three months, indicating that both the groups showed improvement in the above clinical parameters. However, on comparing between the groups, the test group showed significant improvement only in gingival inflammation than the control group after one month and three months.

	Test Group	Control Group	p-value Unpaired t-test
Age in years	30.05 ± 11.00	37.6 ± 13.63	0.08 (NS)
PI	2.46 ± 0.28	2.52 ± 0.25	0.55 (NS)
GI	2.60 ± 0.31	2.67 ± 0.22	0.49 (NS)
PD	6.6 ± 0.73	6.7 ± 0.53	0.57 (NS)

[Table/Fig-1]: Demographic and Baseline parameters
PI= Plaque index, GI = Gingival Index, PD = Probing Depth, NS = Not Significant

	Day 0 (baseline)	1 month	3 months	p-value paired t-test
Test group	2.46 ± 0.28	0.36 ± 0.10	0.50 ± 0.11	< 0.001 (HS)
Control group	2.52 ± 0.25	0.41 ± 0.10	0.57 ±0.08	< 0.001 (HS)
p-value Unpaired t-test	0.55 (NS)	0.26 (NS)	0.058 (NS)	

[Table/Fig-2]: Comparison of Plaque index between the groups
NS = Not Significant, HS = Highly Significant

	Day 0 (baseline)	1 month	3 months	p-value paired t-test
Test group	2.60 ± 0.31	0.17 ± 0.07	0.25 ± 0.12	< 0.001 (HS)
Control group	2.67 ± 0.22	0.31 ± 0.12	0.49 ± 0.10	< 0.001 (HS)
p-value Unpaired t-test	0.49 (NS)	0.001(HS)	< 0.001 (HS)	

[Table/Fig-3]: Comparison of Gingival index between the groups
NS = Not Significant, HS = Highly Significant

	Day 0 (baseline)	1 month	3 months	p-value paired t-test
Test group	6.6 ± 0.73	5.36 ± 0.58	4.86 ± 0.58	< 0.001 (HS)
Control group	6.7 ± 0.53	5.6 ± 0.54	4.9 ± 0.56	< 0.001 (HS)
p-value Unpaired t-test	0.57(NS)	0.26(NS)	0.75(NS)	

[Table/Fig-4]: Comparison of Probing depth between the groups
NS = Not Significant, HS = Highly Significant

DISCUSSION

The bacterial aetiology for periodontal disese has been explored for over several years. Although earlier studies have supported that bacterial plaque is the primary aetiologic agent for periodontal disese [11]. Current thinking implicates that the majority of periodontal tissue destruction is caused by an inappropriate host response to the plaque bacteria and their products [12]. More specifically, loss of homeostatic balance between proteolytic enzymes and their inhibitors, reactive oxygen species and the antioxidant defense systems are believed to be responsible [13].

Reduced form of CoQ10 ie ubiquinol is an intracellular, lipid soluble and lipid protective antioxidant. It is both exogenous and endogenous i.e it can be synthesized in liver and is also available from food. Supplemental CoQ 10 has good safety record. No adverse affects have been reported with daily dosage ranging from 600 to 1200 mg [14]. Findings from the studies of Littaru, Henson and Nakamura support that periodontal disease is frequently associated with CoQ10 deficiency [9,10,13].

Matsumura et al., through his double blind trial reported that for certain patients with periodontitis, oral hygiene when combined with therapy using CoQ could provide improved treatment and long term benefits [15]. Hanioka et al., evaluated the effect of subgingival debridement with topical application of CoQ10 to periodontal pockets. He observed that sites that received CoQ10 topical application along with subgingival debridement showed significant improvements in the modified gingival index and bleeding on probing when compared to sites that received only subgingival debridement [16].

In our study, though no significant difference was observed in plaque index and probing depth between two groups. However, significant reduction in gingival inflammation was seen in patients who were put on oral supplements of CoQ 10 after scaling and root planing compared to patients who received only scaling and root planing. Wilkinson et al., also reported that eight patients under routine care for periodontitis, when recieved oral treatment with a form of CoQ showed significant reduction in pocket depth [17].

In contrast to the above results a study by Hans. M reported that in chronic periodontitis patients, sub-gingival mechanical debridement alone and with Perio-Q (CoQ) gel showed almost similar clinical results without any statistically significant differences. The result of their study did not provide enough clinical support for the superiority of adjunctive use of Perio-Q gel [18].

Hanioka et al., suggested that the oxygen supply for inflamed gingiva may be increased [16]. Evaluation of the effect of CoQ10 on the oxidative metabolism in gingiva of periodontitis patients using reflectance spectrophotometry suggested that the administration of CoQ10 improves oxygen utilization in the gingival tissue [19]. Denny et al., assessed the antioxidant and anti-inflammatory effects of co-enzyme Q10 in 10 non-smoking periodontally healthy volunteers. They also demonstrated reductions in gingival bleeding after 28 days of supplementation but found no changes in gingival crevicular fluid total antioxidant capacity, indicating that the potentially beneficial effects of co-enzyme Q10 may be independent of its antioxidant activity [20]. Thus the decrease in gingival inflammation in our study can be hypothesized to have resulted from correction of deficiency of CoQ10 and restoration of the metabolic energy required for the diseased tissue.

Studies have suggested that CoQ10 also exerts anti-inflammatory properties via NFκB1-dependent gene expression [21]. Because this is a common pathway for periodontal inflammation, even this could be the possible mechanism for reduction in gingival inflammation due to CoQ10 supplementation.

In certain patients deficiency of CoQ at the inflammed gingival sites may exist independently of and/or because of periodontal disease. In such patients, scaling, root planing and oral hygiene could correct the microbial cause, but not that part of the deficiency of CoQ10 due to systemic cause; therapy with CoQ10 can be included with the oral hygiene for an improved treatment of this type of periodontal disease.

CONCLUSION

This short term study with small sample size showed significant reduction of gingival inflammation when Coenzyme Q10 oral supplements are used as an adjunct to scaling and root planing than scaling and root planing alone. Existing evidence indicates that gingivitis precedes the onset of periodontits. Therefore, CoQ10 supplementation along with scaling and root planing can prevent periodontitis by reducing gingival inflammation. Further long term randomized, blinded clinical trials for the outcomes of topical and systemic administration of Q10 are needed to affirm or refute the usefulness of Q10 as a therapeutic agent for periodontitis.

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