

Clinical Evaluation of Co-enzyme Q10 in Management of Chronic Periodontitis Patients: Mouth Split Study

Ali K. Barakat¹, AlaaMoustafa Attia²

¹Dental intern, Faculty of Dentistry, Umm Alqura University, Saudi Arabia.

²Associate Professor of Oral medicine and Periodontology, Faculty of Dentistry Al-Azhar University (Assiut), Egypt and Umm Alqura University, Saudi Arabia.

Corresponding Author: Ali K. Barakat

ABSTRACT

Background: Co-enzyme Q10 (CoQ10) is an antioxidant agent which can suppress the inflammatory process in periodontium. Some studies investigated the effectiveness of this agent as an adjunctive to non-surgical periodontal therapy.

Aim: the present study aimed to evaluate the effectiveness of CoQ10 gel in management of chronic periodontitis patients as an adjunctive periodontal therapy.

Materials and Methods: Twenty chronic periodontitis patients (25-60 years old) were evaluated by the following clinical parameters: bleeding index (BI), plaque index (PI), probing pocket depth (PPD) and clinical attachment loss (CAL). They received non-surgical periodontal therapy on two visits, the CoQ10 gel was applied intra-pocket in the buccal right sites of jaws and packed by periodontal dressing for one week, while the left sites treated only by scaling and root planning (SRP). The patients were clinically evaluated after one month; the data were collected and statistically analyzed.

Results: In both quadrants treated by CoQ10/SRP and SRP only; the statistical comparisons of mean values for all parameters (PI, BI, PD, CAL) before and after treatment revealed highly significant difference ($P \leq 0.01$). Before treatment in both quadrants which treated by CoQ10/SRP and SRP, there is no statistical differences between the mean values of all clinical parameters ($P \geq 0.05$). Furthermore, statistical comparisons between the mean values of all clinical parameters after treatment in quadrants treated by CoQ10/SRP and SRP only revealed highly significant difference ($P \leq 0.01$).

Conclusion: CoQ10 gel intra-pocket applications packed by periodontal dressing provide precious clinical outcomes and considered as a useful adjunctive agent with non-surgical periodontal therapy.

Keywords: Chronic periodontitis, Intra-pocket, Co-enzyme Q10 gel.

INTRODUCTION

Periodontitis is a chronic inflammatory process which initiated by plaque biofilm that challenge with immune response and can lead to alveolar bone loss and exposure of root surface that ultimately result in tooth loss, the host microbial interaction including: cellular, humoral factors and series of inflammatory cytokines. The periodontal destruction is caused by inappropriate host response to

several periodontal pathogens (*Porphyromonas gingivalis*, *Aggregatibacter actinomycetemcomitans*, *Prevotella intermedia*, *Fusobacterium nucleatum*, *Tannerella forsythia* etc.) and their products. ^[1]

The inflammatory periodontal tissues infiltrated by polymorphonuclear leukocytes, macrophages and subsequent oxidative phagocytosis ends in generating of free radicals and reactive oxygen species

(ROS) such as: super oxide anion radicals, hydrogen peroxide, hydroxyl radicals and hypochlorous acid, all capable of damaging either cell membranes or associated biomolecules. [2]

Several antioxidants can scavenge the free radicals and the ROS that affecting on cell membranes, impair DNA and even cell death, the antioxidants such as: Alpha-tocopherol and Vitamin C, the antioxidants are used as supplements to counter act the over production of free radicals in periodontal disease, and used as an adjunctive therapy to scaling and root planning in periodontal disease patients, in last decades a products like CoQ10 which is a compound found naturally in the energy producing organelle found within the cell named a Mitochondria. [3,4]

Deficiency of CoQ10 is reported in inflamed gingival tissues. [5] The therapy with CoQ10 can be associated with oral hygiene for an improvement for the periodontal treatment by both local and systemic oral administration. [6] The Gingival biopsies express low tissue level of CoQ10 in 60% to 96% patients with periodontitis and decreased level of CoQ10 in leukocytes in 86% of cases. [7] These findings indicated that periodontal disease is frequently associated with CoQ10 deficiency.

Chronic periodontitis patients have low concentrations of CoQ10 in gingival tissue and blood. This fact has led some clinical investigators and dentists to recommend CoQ10 supplementation, particularly for diabetic patients and others at risk for periodontal disease. [8]

The antioxidant effectiveness of CoQ10 systemic or topical supplemental agent in the treatment of chronic periodontitis patients gives better results and improves parameters compared to scaling and root planning alone. [9-11] Moreover, Intra-pocket application of CoQ10 gel showed an improvement in periodontal parameters more compared to systemic and topical application in treatment of diseased periodontal tissues. [12,13]

Either topical or intra-pocket application of CoQ10 gel was reported with several studies but the well improvements in periodontal parameters were increased in patient treated by intra-pocket versus topical clinical application. [12-14]

In split mouth study by Hans et al., [15] reported that the sub-gingival mechanical debridement only and with CoQ10 gel showed almost similar clinical results without any statistically significant differences and concluded that CoQ10 gel in this study may have a potential additive effect.

Regarding to intra-pocket application of CoQ10 in management of chronic periodontitis there are a controversial result, so that the present study aimed to investigate the clinical effectiveness of intra-pocket application of CoQ10 gel packed by periodontal dressing for one week in non-surgical periodontally treated chronic periodontitis patients for one month later.

MATERIALS AND METHODS

Patients Selection

A total 20 moderate chronic periodontitis patients were selected from Periodontics Clinic, College of Dentistry, Umm-Alqura University. The clinical procedures were taken with the understanding and written consent of the patient, following protocols reviewed and approved by the ethical committee of the institution.

The clinical split mouth trial was conducted to compare the efficacy of scaling and root planing plus intra-pocket application of CoQ10 gel in right buccal periodontal sites comparing to scaling and root planing (SRP) alone in left sites of both jaws. Patients (male sex 25-60 years) with mean age (40 ± 4.33) are systemically healthy (Cornell medical Index). [16] Subjects on antibiotics for last three months and who had undergone periodontal therapy in the past six months and patients with systemic diseases were excluded in this study. The Patients informed about the

treatment procedure and written informed agreement was taken.

Periodontal examination

The periodontal conditions were evaluated for all subjects for baseline and 30 days using following parameters; PI, BI, PD and CAL. [17-19]

Periodontal Therapy

All individuals at baseline were carried out to nonsurgical periodontal treatment include SRP and subgingival debridement by using of ultrasonic scaler and Gracey curates [20] on two visits.

Intra-pocket application of CoQ10 gel

The chronic periodontitis patients after receiving the non-surgical periodontal therapy, the mouth was divided into right and left sides, the right buccal periodontal sites. treated with SRP plus intra-pocket application of 0.2 ml of CoQ10 gel CoQ10 (Perio Q™ gel, Hamilton, U.S.A). For the left buccal periodontal sites only treated with SRP.

Statistical analysis

Statistical analysis was done by using SPSS (statistical package for social science) program version 22. The quantitative data were presenting in the following; mean and standard deviation. Paired and unpaired T-test used to analyze the quantitative data. The significance was considered when P value was ≤ 0.05 . The statistical data was tabulated and graphed by using Microsoft-word 2015.

RESULTS

The present split mouth study performed on 20 moderate chronic periodontitis patients treated by SRP, the mouth was divided into right and left sides, the right buccal sites were treated by SRP and intra-pocket application of CoQ10 gel and packed by periodontal dressing for 1 week, while the left buccal sites were treated only with SRP. The readings of clinical parameters (PI, BI, PD and CAL) were taken before and after treatment 1 month later.

Evaluation of periodontal parameters

In both sites treated by CoQ10 gel/SRP and SRP only, the statistical comparisons of mean values for all parameters (PI, BI, PD, CAL) before and after treatment revealed highly significant difference ($P \leq 0.01$). (Tables 1-4), (Figures 1-4). Before treatment in both sites which treated by CoQ10/SRP and SRP only, there is no statistical differences between the mean values of all clinical parameters ($P \geq 0.05$). In comparison between the mean values of all clinical parameters after treatment in both sites treated by CoQ10/SRP and SRP only. The statistical analysis revealed highly significant differences in sites treated by CoQ10 gel/SRP compared to sites that treated by SRP only ($P \leq 0.0$).

Table (1) demonstrates the statistical comparisons in sites treated by CoQ10 gel plus SRP.

	Mean \pm SD	T Value	P Value
Plaque Index (PI)	Before (81.91 \pm 8.60)	15.58	0.000***
	After (28.25 \pm 8.78)		
Bleeding Index (BI)	Before (79.66 \pm 9.80)	15.73	0.000***
	After (28.83 \pm 8.56)		
Pocket Depth (PD)	Before (3.76 \pm 0.49)	8.31	0.000***
	After (3.17 \pm 0.51)		
Clinical Attachment Loss (CAL)	Before (2.76 \pm 0.47)	20.76	0.000***
	After (2.30 \pm 0.49)		

Table (2) demonstrates the statistical comparisons in sites treated by SRP only.

	Mean \pm SD	T Value	P Value
Plaque Index (PI)	Before (81.33 \pm 7.66)	13.99	0.000***
	After (38.83 \pm 7.01)		
Bleeding Index (BI)	Before (79.33 \pm 7.97)	17.09	0.000***
	After (38.66 \pm 7.36)		
Pocket Depth (PD)	Before (3.83 \pm 0.55)	3.69	0.004**
	After (3.50 \pm 0.54)		
Clinical Attachment Loss (CAL)	Before (2.83 \pm 0.49)	8.20	0.000***
	After (2.51 \pm 0.53)		

Table (3) reveals the statistical differences in sites treated with and without CoQ10 gel before SRP.

	Mean ± SD	T Value	P Value
Plaque Index (PI)	SRP/CoQ10 (81.91±8.66)	0.359	0.727
	SRP (81.33±7.66)		
Bleeding Index (BI)	SRP/CoQ10 (79.66±9.80)	0.202	0.843
	SRP (79.33±7.96)		
Pocket Depth (PD)	SRP/CoQ10 (3.76±0.49)	- 0.983	0.347
	SRP (3.83±0.55)		
Clinical Attachment Loss (CAL)	SRP/CoQ10 (2.76±0.47)	- 1.055	0.314
	SRP (2.83±0.49)		

Table (4) shows the statistical differences in sites treated with and without CoQ10gel after SRP.

	Mean ± SD	T Value	P Value
Plaque Index (PI)	SRP/CoQ10 (28.25±8.78)	- 8.29	0.000***
	SRP (38.83.33±7.01)		
Bleeding Index (BI)	SRP/CoQ10 (28.83±8.56)	- 6.526	0.000***
	SRP (38.55±7.36)		
Pocket Depth (PD)	SRP/CoQ10 (3.17±0.51)	- 5.087	0.000***
	SRP (3.50±0.54)		
Clinical Attachment Loss (CAL)	SRP/CoQ10 (2.30±0.49)	- 3.398	0.006**
	SRP (2.51±0.53)		

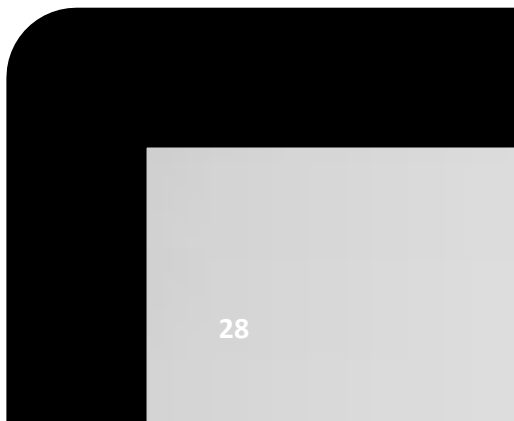


Figure (1): illustrate the mean values of Plaque index (PI) in both sites treated by SRP/CoQ10 and SRP only.



Figure (3): illustrate the mean values of plaque index (PD) in both sites treated by SRP/CoQ10 and SRP only.

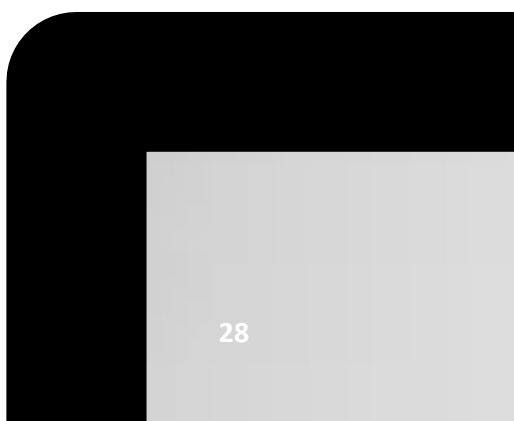


Figure (2): illustrate the mean values of bleeding index (BI) in both sites treated by SRP/CoQ10 and SRP only.



Figure (4): illustrate the mean values of clinical attachment loss (CAL) in both sites treated by SRP/CoQ10 and SRP only.

DISCUSSION

Periodontitis is an immuno-inflammatory process resulting from the

interaction of a bacterial attack and host inflammatory response, causing inflammation of the supporting tissues of the teeth leading to tissue destruction and tooth loss. [21] The inflammatory response leading to production of several oxidative molecules that damaged the periodontal tissues. Periodontal pathogens can induce ROS overproduction and thus may cause collagen and periodontal cell breakdown. When ROS are scavenged by antioxidants, there is a reduction of collagen degradation. [21] Oxidative stress arises within tissues when the normal balance between ROS generation and antioxidant defense shifts in favor of the former, a situation arising from either an excess of ROS and/or a depletion of antioxidants. [22] The concept of antioxidant therapy in the treatment of numerous diseases including inflammatory periodontal disease exists in the literature. [23] Because of its function, CoQ10 has received much research attention in a medical literature in the last several years. The mechanism of CoQ10 had not been known until some researchers report its deficiency in patients with periodontal disease. [24]

The aim of the present study was to evaluate the adjunctive therapy of CoQ10 gel clinically through the evaluation of parameters (PI, BI, PD, CAL). This hypothesis is supported by author's research they are using intra-pocket application of CoQ10 adjunct to SRP. [15,22,25]

The present study demonstrated significant improvement in all clinical parameters (PI, BI, PD, CAL) in both sites treated and not treated with intra-pocket CoQ10 gel, this finding in agreement with some studies. [26-28]

Furthermore, the statistical comparison of clinical outcomes of periodontal parameters after treatment on both sites that treated and not treated with CoQ10 gel showed a highly significant reduction in sites treated with SRP/CoQ10 gel versus sites treated with SRP only. These results are in agreement with several studies. [7,15,29] On the other hand, there're several reports inconsistent

with our results, they demonstrated that no significant differences between sites treated with or without CoQ10 gel adjunct to periodontal therapy. [22,24,30]

The present study showed high significant differences among all periodontal clinical parameters in all sites treated with SRP/CoQ10 packed by periodontal dressing compared to sites treated by SRP only. For explanation, periodontal dressing that applied for one week after intra-pocket application of CoQ10 may have a strong effect on the findings, through slow release of CoQ10 by GCF.

In other split mouth study by Hans et al. 2010, [15] applicate intra-pocket CoQ10 gel in periodontal sites treated by SRP and not packed by periodontal dressing, they reported that a highly significant improvement of all periodontal clinical parameters. This finding is similar to our clinical outcomes.

Systemic supplements of CoQ10 can be used as an adjunctive to periodontal therapy. Manthena et al. 2015, [9] and Prakash et al. 2010, [10] reported a significant difference in gingival inflammation after treatment intervals when compared to control group.

Saini 2018 [11] reported that treated subjects with SRP incorporated with dietary supplement of CoQ10 showed a highly significant reduction to all periodontal clinical parameters when compared to subjects treated by SRP only. He concluded that the "long term regular intake of nutritional dietary supplement of CoQ10 is more beneficial in nonsurgical treatment outcome of periodontal disease".

The periodontal inflammation was suppressed by local and systemic administration of CoQ10, [7,9-11,15,29] these outcomes revealed that the immunological effectiveness of CoQ10. Jin et al. 2014 performed an experimental study on rats, they reported that systemic supplement of CoQ10 inhibit the expression of tumor necrotic factor- α (TNF- α) and promote the expression of interleukin-10 (IL-10) in

gingival tissues in experimented periodontitis rats. [31] In addition, a human study showed significant difference in levels of GCF-(TNF- α) in patients treated by CoQ10 gel/SRP versus SRP only. [24] According to the previous knowledge, further investigations are needed to clarify the immunological and microbiological effectiveness of CoQ10 in management of periodontal diseases.

Finally, the present study suggested that CoQ10 intra-pocket application packed by periodontal dressing for one week provide a benefit clinical effectiveness with SRP and can considered as a precious adjunctive agent in non-surgical periodontal therapy.

CONCLUSION

The current study concluded the followings:

1. CoQ10 gel intra-pocket applications packed by periodontal dressing provide a precious clinical outcome and considered as a useful adjunctive agent with non-surgical periodontal therapy.
2. Further research is suggested to clarify the immunological effectiveness of intra-pocket application of CoQ10 gel.

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