

*Original research***Clinical evaluation of topical application of CNBC gel (Coenzyme Q10) in chronic periodontitis patients.**

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Background and Objectives: Coenzyme Q10 is a well studied antioxidant in medical literature, but studies regarding its efficacy in periodontal diseases are few. Hence, the aim of this study was to test the efficacy of coenzyme Q10 in the form of gel CNBC gel in patients with chronic gingivitis and periodontitis. **Materials and Methods:** A total of 12 patients were enrolled. A split mouth design was used for, intra-pocket application combined with scaling; root planing and SRP only in each quadrant, respectively. Clinical parameters such as plaque index, gingival index, gingival bleeding index, probing pocket depth, clinical attachment level were assessed at baseline, 30 days, and 90 days. The results were subjected to statistical analysis, which were expressed as mean \pm SD and proportions as percentages. Intra group comparisons were made by paired t-test and one way analysis of variance for inter-group comparisons. Categorical data was analyzed by post-hoc Bonferroni test. **Results:** The results showed on intra-group analysis significant reduction ($P < 0.01$) of clinical parameters (plaque index (PI), gingival index, gingival bleeding index, periodontal probing pocket depth, and clinical attachment level) in both the treatment groups, whereas on inter-group analysis, intra-pocket gel application in combination with SRP showed non significant reduction ($P < 0.05$) for each clinical parameters in comparison to SRP alone.

Key words : Coenzyme Q10, CNBC gel, chronic gingivitis and periodontitis, clinical attachment level, Scaling and root planing.

INTRODUCTION

Inflammation represents the response of the organism to a noxious stimulus, whether mechanical, chemical, or infectious. It is a localized protective response elicited by injury or destruction of tissues which serves to destroy, dilute, or wall off both the injurious agent and the injured tissue. Whether acute or chronic, inflammation is dependent upon regulated humoral and cellular responses, and the molecules considered to mediate inflammation at one time or another are legion.¹

However, an event characteristic of mammalian inflammation, tissue infiltration by polymorphonuclear leukocytes and monocytes, and subsequent phagocytosis features non-mitochondrial O₂ consumption, which may be 10 or 20 times that of resting consumption ultimately ends in generating free radicals (FR) and reactive oxygen species (ROS) like superoxide anion radicals, hydrogen peroxide, hydroxyl radicals, and hypochlorous acid, all capable of damaging either cell membranes or associated biomolecules¹. Coenzyme Q10 was

discovered by Fred Crane and his colleagues in 1957 in beef heart mitochondria.² It was first isolated from the mitochondria of bovine hearts in 1957 at the University of Wisconsin. Identification of the chemical structure and synthesis was completed by 1958. Because of its ubiquitous presence in nature and its quinone structure (similar to that of vitamin K), Coenzyme Q10 is also known as ubiquinone.³ CoQ10 is a substance of nutritional nature and is a vitamin on the basis of an updated definition of a vitamin by Folkers.⁴

It has an extraordinarily long isoprenoid side chain in the 6-position of its 2,3-dimethoxy-5-methyl benzoquinone structure, which is widely distributed in the tissues of the human body.⁵ It exists naturally in the mitochondria of all cells in the human body, and has indispensable functions in the bioenergetics of human tissues, including the gingiva.⁶ Crane has concisely summarized the currently recognized functions of CoQ10 as: needed for energy conversion (ATP production), an essential antioxidant, regenerates other antioxidants,

stimulates cell growth, and inhibits cell death.² A deficiency of Coenzyme Q10 at its enzyme sites in gingival tissue may exist independently of and/or because of periodontal disease. If a deficiency of coenzyme Q10 existed in gingival tissue for nutritional causes and independently of periodontal disease, then the advent of periodontal disease could enhance the gingival deficiency of coenzyme Q10.⁷ In such patients, oral dental treatment and oral hygiene could correct the plaque and calculus, 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. Gingival biopsies from patients with inflamed periodontal tissues showed a deficiency of CoQ10, in contrast to patients with normal periodontal tissues.⁸ Many clinical trials with oral administration of CoQ10 to patients with periodontal disease have been conducted. The results have shown that oral administration of CoQ10 increases the concentration of CoQ10 in the diseased gingiva and effectively suppresses advanced periodontal inflammation.^{9,10,11}

Thus, we speculate that a concentration of CoQ10 applied to the periodontal pocket may improve periodontal inflammation. There are no study conducted to evaluate the effect of CoQ10 gel into the periodontal pocket as an local drug delivery therapy in patient with generalized chronic periodontitis. Therefore, to evaluate the benefit of CoQ10 gel in periodontal pocket in patient with chronic periodontitis , a clinical trial was conducted.

MATERIALS AND METHODS

This was a randomized, controlled, single-blinded clinical trial with a split-mouth design, intended for comparison of two treatment modalities:

Scaling and root planing plus intrapocket CNBC gel (Coenzyme Q10); (fig 1) and Scaling and root planing (SRP) only in patients diagnosed with chronic periodontitis.

The trial was undertaken in Department of Periodontics, Rama dental college hospital & research centre, Kanpur. Both sexes belonging to age group of 22 – 55 years were included in the study. Informed consent was taken from all



Fig 1.intrapocket CNBC gel (Coenzyme Q10)

the patients and the ethical clearance was obtained from the ethical committee. Inclusion criteria included patients who were diagnosed with chronic generalized periodontitis (AAP-1999) and patients selected should have periodontal pocket measuring 4-8 mm in different quadrants of the mouth on clinical examination with radiographic evidence of bone loss.

Exclusion criteria included those subjects who were taking antibiotics in last three months, patients who had undergone periodontal therapy for past six months, patients with systemic diseases and smokers, and patients who were pregnant and lactating mothers. A total number of 12 patients with a minimum of 2 sites/quadrant in each patient participated in the study. In each patient, two quadrants were randomly assigned as follows.

Test group

These sites were treated with SRP along with intrapocket application of CNBC gel.

Control group

These sites were treated by SRP alone without Perio-Q gel application.

Periodontal examinations were performed before and after three and six weeks after the beginning of the experiment. Periodontal assessments were performed using the plaque index (PI; Silness and Loe 1964) gingival bleeding index (GBI; Ainamo and Bay, 1975), and gingival index (GI; Loe and Silness, 1963) Periodontal probing pocket depth (PPD) and clinical attachment level (CAL) [Figure 2 and 3] were measured using UNC -15 probe.

On the first day, recording of the clinical parameters for all four quadrants was done. The second day SRP were performed in control

group and in Test group, using hand instruments and ultrasonic scalers. The third day constituted of application of the CNBC gel. Intrapocket application was done by Max-i-Probe (Dentsply, USA) irrigation needles were



Fig 2 (test site) Fig 3 (control site) : PPD and CAL at 0 day

modified to deliver the gel intrapocket (Test group). The periodontal pocket was dried with paper points before sub gingival administration of CNBC gel. Subgingival administration was accomplished by inserting the syringe to the base of the periodontal pocket first and then placing the gel while working the way up, until the gingival margin.

All the clinical parameters were recorded after three and six weeks (Fig 4 & Fig 5) after treatment. Data obtained after treatment was compared with the initial values. Results were expressed as mean±SD and proportions as percentages. Intragroup comparisons were made by paired t-test and one way analysis of variance (ANOVA) for intergroup comparisons. Categorical data was analyzed by post-hoc Bonferroni test. For all the tests a P-value of 0.05 or less was considered for statistical significance.

RESULTS

On comparing mean plaque index, gingival index, gingival bleeding index, probing pocket

depth, clinical attachment level among all the groups at 3rd and 6th week showed statistically significant results (P<0.01) [Tables 1-5].

On intergroup comparison of PI, statistically significant result was found between test and control group [Table 6]. GBI also showed significant result between test and control group at 0-6th week [Table 8]. PPD showed significant result between test and control group [Table 10].



Fig 4 (test site) and Fig 5 (control site) : PPD and CAL at 6 weeks ;

Table 1: Comparison of test and control of various indices

		Control		Test		p-value
		Mean	SD	Mean	SD	
PI	Baseline	2.63	.48	2.80	.36	0.101
	30 th day	1.29	.39	1.26	.40	0.749
	90 th day	1.23	.36	.79	.53	< 0.001
GI	Baseline	2.62	.39	2.74	.38	0.116
	30 th day	1.25	.67	1.09	.62	0.106
	90 th day	1.14	.68	.78	.45	< 0.006
SBI	Baseline	3.75	.38	3.87	.34	0.101
	30 th day	2.15	.44	2.05	.46	0.090
	90 th day	2.28	.51	1.29	.37	< 0.001
PPD	Baseline	6.85	.63	6.94	.42	0.01
	30 th day	5.66	.68	4.51	.56	< 0.001
	90 th day	4.71	.52	3.51	.61	< 0.001
CAL	Baseline	6.46	.89	6.66	.73	0.101
	30 th day	5.46	.89	4.77	.94	< 0.001
	90 th day	4.46	.89	3.56	.38	< 0.001

DISCUSSION

The concept of antioxidant therapy in the treatment of numerous diseases including inflammatory periodontal disease exists in the literature. Because of its function, CoQ10 has

Table 2: Intra-group (Comparison of baseline through follow-up)

		Control		p-value	Test		p-value
		Mean	SD		Mean	SD	
PI	Baseline	2.63	.48	<0.001	2.80	.36	<0.001
	30 th day	1.29	.39	B>30 th ,	1.26	.40	B>30 th >
	90 th day	1.23	.36	90 th	.79	.53	90 th
GI	Baseline	2.62	.39	<0.001	2.74	.38	<0.001
	30 th day	1.25	.67	B>30 th ,	1.09	.62	B>30 th >
	90 th day	1.14	.68	90 th	.78	.45	90 th
SBI	Baseline	3.75	.38	<0.001	3.87	.34	<0.001
	30 th day	2.15	.44	B>30 th >	2.05	.46	B>30 th >
	90 th day	2.28	.51	90 th	1.29	.37	90 th
PD	Baseline	6.85	.63	<0.001	6.94	.42	<0.001
	30 th day	5.66	.68	B>30 th >	4.51	.56	B>30 th >
	90 th day	4.71	.52	90 th	3.51	.61	90 th
CAL	Baseline	6.46	.89	<0.001	6.66	.73	<0.001
	30 th day	5.46	.89	B>30 th ,	4.77	.94	B>30 th >
	90 th day	4.46	.89	90 th	3.56	.38	90 th

(Repeated Measures ANOVA with post-hoc Bonferroni test)

Table 3: Paired t test

	Difference	Control		p-value	Test		p-value
		Mean	SD		Mean	SD	
PI	30	1.34	.62	0.013	1.54	.46	0.003
	90	1.39	.54	<0.001	2.01	.66	<0.001
GI	30	1.37	.59	0.015	1.65	.68	0.005
	90	1.48	.65	0.001	1.96	.54	0.001
SBI	30	1.60	.45	<0.001	1.82	.48	<0.001
	90	1.47	.50	<0.001	2.59	.53	<0.001
PD	30	1.19	.17	<0.001	2.43	.50	<0.001
	90	2.14	.30	<0.001	3.43	.65	<0.001
CAL	30	1.00	.24	<0.001	1.89	.80	<0.001
	90	2.00	.24	<0.001	3.10	.66	<0.001

received much research attention in a medical literature in the last several years. However, there is a dearth of new information regarding CoQ10 in the treatment of periodontal conditions. Hence, based on new concepts of synergism with nutritional supplements and host response, we designed a randomized controlled, single-blinded clinical trial with a split-mouth design, intended for comparison of two treatment modalities: Scaling and root planing plus intrapocket CNBC gel (CoQ10), and

Scaling and root planing (SRP) only in patients diagnosed with chronic periodontitis.

There were certain problems encountered during our study which included difficulty in intrapocket placement of the gel due to unfavorable thixotropic properties of the gel, although the pocket was filled up from its base to the coronal aspect; thoroughness remained a question. Substantivity of the gel used was not known; thus bioavailability of CoQ10 cannot be commented upon. It was neither a sustained release nor a controlled release formulation; therefore, it may have had a short wash out period even though post gel application instructions were given.

During the study, four patients gave highly positive statements in aspect of subjective feeling of improvement of periodontium condition, which additionally confirmed the effectiveness of applied supporting therapy. No adverse reactions were reported in the study. Topical (extrasulcular) application of gel along with SRP resulted in significant reduction ($P<0.01$) of plaque index, gingival index, and gingival bleeding index during 30 days and at 90 days. Results were similar to Matthews-Brzowska et al. 2007⁵ suggesting that the gel could be a treatment option for gingivitis cases and also is a convenient method for patients for home use. On intragroup comparison, SRP only and SRP with gel had shown similar clinical results, which was not statistically significant, but in comparison with combination of gel and SRP, group has proved to be better.

Thus, in this study, improvement in chronic periodontitis patients occurred mainly along with a combination of gel and conventional nonsurgical periodontal therapy.

CONCLUSION: Intra-pocket application of CNBC gel with mechanical debridement improved the clinical parameters. In chronic periodontitis patients, sub-gingival mechanical debridement only and with CNBC gel showed almost similar clinical results without any statistically significant differences. The result of the present study evaluated on a short term basis confirmed the primary role of basic mechanical

approaches in periodontal therapy and did not provide enough clinical support for the superiority of adjunctive use of CNBC gel. However, it appears that CNBC gel in this study may have a potential additive effect. This study necessitates further studies with other antioxidant agents for designing a strategy for the use in clinical practice. Further long term clinical studies of CNBC gel, with various doses and duration, need to be conducted.

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How to cite this article: Roopa DA, Gupta R, Gupta I, Chauhan S, Pandey A, Sharma NK. Clinical evaluation of topical application of CNBC gel (Coenzyme Q10) in chronic periodontitis patients. *J Dent Res Updates* 2014 Dec;1(1):13-17

Sources of support: Nil

Conflict of Interest: None declared