

Comparative evaluation of Coenzyme Q10 dentifrice Vs. Commercially available dentifrice in treatment of gingivitis: a randomized double blinded clinical trial.

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Abstract: Background: Gingivitis is the most common forms of periodontal disease seen among all age groups. It is an inflammation of gingiva without any destruction of underlying periodontal structures. Deficiency of coenzyme Q10 in the gingival tissues may lead to gingivitis. Therefore, this study was undertaken to evaluate the anti- gingivitis effect of Co enzyme Q10 as a dentifrice.

Methods: Thirty patients were enrolled in the double blinded randomized controlled trial wherein 15 patients were allocated in test group and 15 patients in control group. For each patient scaling was performed and Co enzyme Q10 dentifrice given in test group and Colgate advanced dentifrice in control group and plaque index(PI), gingival index(GI) and bleeding index(BI) scores were recorded at baseline and 30 days.

Results: Marked reduction of Plaque index, Gingival index, and Bleeding Index were observed after 30 days in both the groups. But, there is no statistically significant difference was observed in both the groups after 30 days.

Conclusions: It can be concluded from the current study that Coenzyme Q10 has potential for reducing the gingival inflammation, when used in the form of dentifrice. No side-effects were noted 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, Colgate advanced dentifrice

Introduction:

Gingival diseases have been affecting the mankind since ages and is well established through various models and experimental studies.^[1] Plaque which is the primary etiological factor for gingivitis is an adherent intercellular matrix attached to the tooth surfaces and dental prostheses.^[2] Although plaque control can be achieved by mechanical and chemical means, mechanical plaque control is the gold standard for an effective way of treating and preventing gingivitis and periodontitis and is the predictive factor in determining the overall prognosis of the treatment.^[3] Dentifrices form an important component of mechanical plaque control as they are the key agent in achieving healthy periodontium.

Dentifrice is a general term used to describe preparations that are used together with a toothbrush to clean and/or polish the teeth. Several formulations with specific chemical agents are marketed.^[4] Among the active agents, Enzymes, Amine alcohols, Herbal or natural products, Triclosan, Bisbiguanides (Chlorhexidine [CHX]), quaternary ammonium compounds (Cetylpyridinium chloride) and different metal salts (Zinc salts, Stannous fluoride [SnF], SnF with amine fluoride) form a vital component of a dentifrice. Brushing twice daily for at least 3 minutes with a fluoride dentifrice is universally recommended by dental professionals.

Although several mechanisms of periodontal tissue destruction have been proposed such as direct bacterial influence and host response to the bacterial invasion, there are also studies evidencing that oxidative stresses may be associated with periodontal inflammation ultimately leading to destruction of structures.^[5] The release of reactive oxygen species along with the host immune response are capable of destroying the cell membranes or biomolecules. 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.^[6] These substances are naturally present in humans as a counter mechanism for these free radicals to reduce the oxidative stresses.^[7] As the tissue destruction which occurs in periodontal connective tissues is majorly due to the free radicals, antioxidants have been used as supplements to counteract the oxidative stresses.^[8]

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. Co enzyme Q10 is naturally present in energy producing cells of mitochondria and participates in the synthesis of ATP. Its deficiency was found in human gingiva, leading to periodontal destruction and which also has the potential to disturb the systemic health causing gastrointestinal disturbances, reducing the blood pressure and causing allergic skin rashes in some people.^[9] Also, a deficiency of Coenzyme Q10 at its enzyme sites in gingival tissue may exist independently 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.^[10] However, the potential benefits of Coenzyme Q10 have not been completely evaluated as very few clinical studies were done in literature. 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 as an adjunct to mechanical scaling.

Research elaborations:

The study was a double blinded randomized controlled clinical trial. A total of 30 patients with 15 per group were included in the study. Study has been reviewed and approved by the ethical board of institution and informed consent has been obtained from the patients participated in the study. The patients with age ranging from 18-45 years, with a minimum of 20 teeth and who have not taken periodontal treatment in past 6 months were included in the study. Patients under anticoagulation medication, antibiotic therapy from past 1 month, smokers, pregnant and lactating women were excluded from the study. The selected patients were randomly assigned into two groups. All the patients underwent complete intra oral examination. After complete ultrasonic scaling the test group patients were given Co-enzyme

Q10 dentifrice (Nature's answer, Periobrite) while control group was given Colgate advanced dentifrice. Both the dentifrices were masked to blind the patients. Patients of all groups were instructed to brush twice daily with their respective dentifrices along with regular oral hygiene instructions. PI, GI and BI scores were recorded at baseline and after 30days.

Results:

Plaque Index

At baseline, plaque index values for the Colgate advanced group (Group A) and Co enzyme Q10 group (Group B) were 1.36 ± 0.16 , 1.34 ± 0.15 respectively. There was no significant difference between the two groups were observed at baseline ($p \geq 0.005$). (Table -1)

After 1month, Group A showed statistically significant decrease in plaque index scores from 1.36 ± 0.16 to 0.66 ± 0.37 ($p \leq 0.00$) (Table-2). Group B also showed statistically significant decrease in the plaque index scores from 1.34 ± 0.15 to 0.51 ± 0.30 ($p \leq 0.001$) (Table-3). However, there is no statistical significance between the two groups in inter group comparison has been observed ($p \geq 0.005$). (Table-4).

Gingival index

At baseline, gingival index values for the Group A were 1.29 ± 0.15 and Group B were 1.31 ± 0.23 . There was no significant difference between the two groups at the baseline ($p \geq 0.005$). (Table -1)

After 1 month, Group A gingival index scores were reduced to 0.35 ± 0.29 ($p \leq 0.001$) (Table -2). Group B also showed a statistically significant decrease from 1.31 ± 0.23 to 0.35 ± 0.26 which was statistically significant ($p \leq 0.001$) (Table -3). However difference between both the groups was not statistically significant. (Table -4).

Bleeding index

Bleeding index scores in both the groups at baseline, were 1.48 ± 0.31 and 1.33 ± 0.15 respectively. There was no significant difference between the two groups at the baseline ($p \geq 0.005$). (Table -1).

After 1month, the bleeding scores reduced from 1.48 ± 0.31 to 0.77 ± 0.39 ($p \leq 0.001$) (Table -2). Group B also showed a statistically significant decrease in the bleeding index values from 1.33 ± 0.15 to 0.77 ± 0.33 ($p \leq 0.001$) (Table -3). However the difference between both the groups was not statistically significant. (Table -4).

Table 1: Descriptive statistics showing the mean values of the plaque index, Gingival Index,

Bleeding index

GROUPS	INDICES	CATEGORIES	n	MEAN	STANDARD DEVIATION
Group-A	PI	BASELINE	14	1.3620	0.16153
		AFTER ONE MONTH	14	0.6614	0.37710
	GI	BASELINE	14	1.2989	0.15326
		AFTER ONE MONTH	14	0.3538	0.29361
	BI	BASELINE	14	1.4818	0.31426

		AFTER ONE MONTH	14	0.7726	0.39019
Group-B	PI	BASELINE	14	1.3439	0.15452
		AFTER ONE MONTH	14	0.5193	0.30174
	GI	BASELINE	14	1.3131	0.23112
		AFTER ONE MONTH	14	0.3571	0.26580
	BI	BASELINE	14	1.3357	0.15892
		AFTER ONE MONTH	14	0.7794	0.33631

PqI – Plaque Index, GI – Gingival Index, BI – Bleeding Index, n- Number of samples

Table 2: Comparison of the mean values of the study indices at Baseline and after one month within the **GROUP A** subjects (INTRA-GROUP COMPARISON):

Variables	Paired Differences			t	n	Sig.
	Mean	95% Confidence Interval of the Difference				
		Lower	Upper			
PLAQUE INDEX	0.70057	0.43133	0.96981	5.621	14	0.000
GINGIVAL INDEX	0.94514	0.71549	1.17480	8.891	14	0.000
BLEEDING INDEX	0.70914	0.53773	0.88056	8.937	14	0.000

Sig.- significant, Significant- p value ≤ 0.005 , n- number of samples, t- test statistic

Table 3: Comparison of the mean values of the study indices at Baseline and after one month within the **GROUP B** subjects (INTRA-GROUP COMPARISON):

Variables	Paired Differences			t	n	Sig.
	Mean	95% Confidence Interval of the Difference				
		Lower	Upper			
PLAQUE INDEX	0.82464	0.60868	1.04061	8.249	14	0.000
GINGIVAL INDEX	0.95593	0.79654	1.11532	12.957	14	0.000
BLEEDING INDEX	0.55636	0.38115	0.73157	6.860	14	0.000

Sig.- significant, Significant- p value ≤ 0.005 , n- number of samples, t- test statistic

Table 4: Overall Comparison of the mean values of the study indices at Baseline and after one month between **GROUP A & GROUP B** subjects (INTER-GROUP COMPARISON):

Mean value comparison of Indices between the groups	Paired Differences			t	n	p-value
	Mean	95% Confidence Interval of the Difference				
		Lower	Upper			
PLAQUE INDEX	0.08011	-0.05199	0.21221	1.244	28	0.224
GINGIVAL INDEX	-0.00875	-0.14420	0.12670	-0.133	28	0.896
BLEEDING INDEX	0.06968	-0.09901	0.23836	0.848	28	0.404

Sig.- significant, Significant- p value ≤ 0.005 , n- number of samples, t- test statistic

Discussion:

There has always been an extensive research to critically study the etiopathogenesis of periodontal diseases. Most of the studies have established that bacterial flora are the primary etiology in disease causation which initiate and aggravates the host response resulting in destruction. Hence periodontal therapy is not only directed towards microbial reduction but also towards host response modulation. Along with various modalities of treatment in periodontal diseases host modulation is being practiced for arresting periodontal diseases since past decades. Agents such as drugs like NSAID's, Tetracyclines, bisphosphonates, estrogen replacement therapy, nutrition supplements, lipoxins and antioxidants have been implicated for host response modulation.^[11]

Antioxidants are the compounds which scavenge the free radicals and arrest the progression of periodontal disease. They are present normally in our body but can also be supplemented in cases of excessive free radical production. Many agents like vitamin- A, C and E, carotenoids, flavonoids, phenols, glutathione, dietary supplements and co-enzyme q 10 have been used till date. In this regard co-enzyme Q 10 is a newer agent which is used as an antioxidant and is a naturally occurring compound found in energy producing cells such as mitochondria. It plays a vital role in the synthesis of ATP and cellular respiration. It exhibits anti-inflammatory, anti-oxidant and immunomodulatory properties. Although Coq 10 exhibits various favorable properties its use has been restricted in the form of oral supplements and local drug delivery agent in adjunct to scaling and root planing.^[12] However, no studies evaluated the effect of co q10 in the form of dentifrice along with conventional therapy.

Ours was the first study to use Coenzyme Q10 as a dentifrice to evaluate the anti-gingivitis properties on plaque. In this study Coenzyme Q10 dentifrice was compared with Colgate advanced conventional dentifrice to evaluate the effects on gingival health.

It was observed in our study that there has been a reduction in plaque scores from baseline to 30 days in Co enzyme Q10 group, although Colgate advanced group also showed the similar results. However, when perio Q gel a Coenzyme Q10 derivative has been used as a local drug delivery agent along with scaling and root planing in a study done by Hans *et al* wherein 12 patients were evaluated in split mouth comparison, results reported that statistically significant reduction in plaque scores were observed from baseline to 3rd and 6th week in perio Q gel group.^[13]

However, in another study done by Manthena *et al* 30 patients were allocated into two groups among which test group was given Co enzyme Q10 as oral supplements and control group was given a placebo after scaling and root planing. Results showed a reduction in the gingival index scores in both the groups but the difference was not statistically significant. This is comparable to gingival index scores of our study.^[14]

The bleeding scores observed in our study were comparable to the study done by Barkat *et al* wherein 30 patients were allocated into a split mouth design, in which scaling and root planing alone was done in control group and perio Q gel as topical gel along with SRP in test group. The reduction in bleeding scores were higher in both the groups from baseline to 30 days and the difference between both the groups was statistically insignificant.^[15]

From the results of the current study it was observed that Coenzyme Q10 had a potential for reducing the gingival inflammation when used in the form of dentifrice. No side-effects were noted in any of the patients. However due to limitations like smaller sample size and short evaluation period these results cannot be generalized.

Conclusion:

In the present study, comparison between Coenzyme Q10 dentifrice and Colgate advanced dentifrice was done. However, both the groups showed similar results. Therefore, future studies are required for testing the antiplaque and anti-gingivitis efficacy of Co enzyme Q10 in form of dentifrice for a long-term period.

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