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EVALUATION OF CLINICAL EFFICACY OF ORALLY ADMINISTERED LYCOPENE AS AN ADJUNCT TO SCALING AND ROOT PLANING IN PLAQUE INDUCED MODERATE TO SEVERE CHRONIC GINGIVITIS"

Dental Science

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ABSTRACT

Background: The inflammatory diseases of the supporting structures of the teeth are amongst the most common chronic diseases to affect adult human beings. Oxidative stress plays a key role in affecting the pathophysiology of both the diseases and adjunctive systemic antioxidant therapy may have beneficial effect on the treatment outcome. Among the antioxidants, lycopene is an effective natural antioxidant and exhibits the highest physical quenching rate with singlet oxygen.

Aim: To evaluate, clinical efficacy of orally administered Lycopene as an adjunct to scaling & root planing in plaque induced moderate to severe chronic gingivitis subjects.

Materials and methods: 40 systemically healthy in age range of 18-35 years, showing clinical signs of gingivitis and probing depth of < 4 mm with no evidence of clinical attachment loss were divided into two groups: experimental group (orally administered Lycopene along with scaling and root planing) and control group (only scaling and root planing) . Plaque Index, Gingival Index, Sulcus Bleeding Index were recorded at baseline and after 2 weeks

Results: Significant mean reduction with plaque index scores, gingival index score, sulcus bleeding index score were observed after 2 weeks for experimental and control group (p value <0.01.

KEYWORDS

INTRODUCTION

The inflammatory diseases of the supporting structures of the teeth are amongst the most common chronic diseases to affect adult human beings. Gingivitis may be defined as an "inflammatory lesion, mediated by host microbial interactions, that is confined to the gingival tissues". Major cause of gingivitis is an accumulation of microbial plaque around the dento-gingival complex, which, when removed, results in complete resolution of the inflammatory state. There seems to be a delicate balance between inflammatory and immune cell interaction which when altered, the pathogens cause direct tissue damage and hyper function of host defence cells **(Chapple IL 1996).**[1]

There is an increasing body of evidence available to implicate reactive oxygen species (ROS) in the pathogenesis of a variety of inflammatory disorders of which periodontal disease is no exception. In recent years, the term ROS has been adopted to include molecules such as hydrogen peroxide (H^2O^2), hypochlorous acid (HOCl) and singlet oxygen ($1O^2$), which whilst not radical in nature can cause substantial tissue damage by initiating free radical chain reactions.[2]

Predominant host inflammatory cells (96%) within the healthy connective tissue and epithelium of the gingiva are Polymorp honucleur leukocyte (PML). Periodonto-pathogenic bacteria in the gingiva-mucosal tissue may functionally activate PML's leading to an increased production of ROS .[2] Chronic inflammation subjects cells to elevated levels of ROS as a result of extracellular release from phagocytic cells.[3] Increase in PML and its activity, results in high amount of ROS release, culminating in increasing oxidative damage to gingival tissue, periodontal ligament and alveolar bone.[3]

A free radical may be defined as any species capable of independent existence that contains one or more unpaired electrons. While most ROS have extremely short half-life, they can cause substantial tissue damage by initiating free radical chain reaction. ROS causes tissue damage through numerous ways that include Deoxyribonucleic acid (DNA) damage, protein-lysis, lipid peroxidation and stimulation of pro-inflammatory cytokines[2].

Antioxidants are regarded as those substances which when present in lower concentration compared to those of an oxidisable substrate will significantly delay or inhibit oxidation of that substrate.[4] Oxidative stress is a state of altered physiological equilibrium within a cell or tissue/organ. It is defined as a condition arising when there is a serious imbalance between the level of free radical in a cell and its antioxidant defence in favour of the former **(Chapple IL, 2007).**[5] Oxidative stress is implicated in the pathogenesis of several chronic inflammatory conditions of which periodontal disease is no exception.[4]

Antioxidants neutralize free radical by replacing one of their electron ending the electron stealing reaction. Lycopene exhibits the highest physical quenching rate with singlet oxygen.[6] In vitro studies have shown lycopene to be twice as potent as β-carotene and ten times that of α-tocopherol in terms of its singlet oxygen quenching ability.[7]

Hence, the present study was conducted to evaluate, clinical efficacy of orally administered lycopene as an adjunct to scaling & root planing in plaque induced moderate to severe chronic gingivitis subjects.

MATERIALS & METHODS:

40 systemically healthy and cooperative subjects in age range of 18-35 years, showing clinical signs of gingivitis and probing depth of < 4 mm with no evidence of clinical attachment loss and with history of no periodontal treatment in last 6 months, were included in the study.

Medically compromised subjects, pregnant females, smokers, subjects with history of medications such as antibiotics and analgesics within past 6 weeks, subjects with history of over the counter anti-oxidants such as Vitamin C, Vitamin E or β-Carotene within the past 3 months were excluded from study.

A detailed case history of subjects was obtained. An informed consent was obtained from the subjects participating in the study. All the subjects were motivated and educated regarding oral hygiene to be practiced during the study period (Modified Bass Technique). Also to refrain from diet containing processed tomatoes (tomato juice, sauce, supplements).

40 subjects were selected for study and divided into two groups (table no. 1)

Table 1:

Experimental Group	Control Group
20 subjects (8 Females/ 12 Males):	20 subjects (13 Females/ 7 Males):
Orally administered Lycopene along with scaling and root planing	Only scaling and root planing.

CLINICAL PARAMETERS ASSESSED: at baseline and 2 weeks

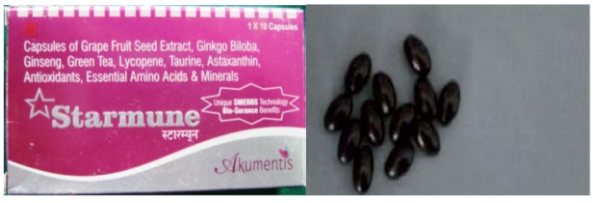
1. Plaque Index (Silness & Loe, 1964)8
2. Gingival Index (Loe & Silness, 1963)9
3. Sulcus Bleeding Index (Muhlemann & Son, 1971)9
4. Russell's Periodontal Index (1956)10 was recorded only to exclude subjects with underlying periodontal disease.

The commercially available antioxidant used in the study (**Starmune TM**, Akumentis Healthcare Ltd, Mumbai, India fig.1) contained natural lycopene with added phytonutrients (table no.2) for synergistic action.

Table 2: composition of lycopene soft gel used in the study

Lycopene	5 mg
Taurine	50 mg
Astaxanthin	1.8 mg
Biotin	30 µg
Green Tea Extracts	10 mg
Grape Fruit Seed Extract	15 mg
Ginkgo Biloba Extract	10 mg
Ginseng Extract	25 mg
Zinc	7.5 mg
Selenium	100 µg
Magnesium	30 mg
Chromium	75 µg

Figure1



STATISTICALANALYSIS:

After the completion of the study, statistical analysis was carried out. The analysis was performed with a statistical software package.

The Paired t-test and the Independent t-test were used to analyze the within group and between group differences respectively. Correlations between mean reduction values with respect to Plaque Index, Gingival Index and Sulcus Bleeding Index under Control and Experimental group were evaluated using One-way ANOVA.

RESULTS:

Table 3:

Index	At baseline		After 2 weeks		Mean reduction after 2 weeks	
	Control group	Experimental group	Control group	Experimental group	Control group	Experimental group
Plaque index	2.01±0.33	1.88±0.39	0.49±0.14	0.49±0.27	1.52±0.33	1.39±0.45
Gingival index	2.01±0.37	1.96±0.35	0.52±0.22	0.40±0.23	1.49±0.42	1.56±0.31
Sulcus bleeding index	2.65±0.72	2.56±0.63	0.80±0.39	0.55±0.30	1.85±0.58	2.01±0.57

On comparison with baseline significant mean reduction in plaque index scores, gingival index score, sulcus bleeding index score were observed after 2 weeks for experimental and control group (p value <0.01)(table 3)

DISCUSSION:

The results of the study were in agreement with the work done by **Chandra et al 2007**,[11] **Shetti NA et al 2012**[12] who evaluated the effect of systemically administered lycopene as monotherapy and as an adjunct to scaling and root planing in gingivitis patients & found statistically significant reductions in gingivitis and gingival bleeding.

Arora N et al, 2013[13]conducted a study to evaluate the efficacy of systemic lycopene along with routine scaling and root planing in terms of changes in clinical parameters and levels of circulating tumor necrosis factor alpha (TNF-α), salivary interleukin 1beta (IL-1ß), and uric acid in chronic periodontitis whereas in present study only the clinical parameters of gingival inflammation were assessed.

Modest approach with Lycopene may be a more effective approach than supplementation with antioxidants such as Vitamin C and Vitamin E, which stoichiometrically scavenge a very small fraction of total oxidant production[14].

As per the results in the present study we can suggest that lycopene shows great promise as a treatment modality in gingivitis. We can thus ascertain the possibility of obtaining an additive effect by combining routine oral prophylaxis with lycopene.

SUMMARY & CONCLUSION

A statistically significant reduction in gingival index score and sulcus bleeding index score after two weeks was observed in experimental group when compared with the control group. Within the limitations of the study it can be concluded that lycopene supplements can be used as an effective adjunct to oral prophylaxis in the treatment of gingivitis. To further evaluate long term effects of lycopene on gingival inflammation expanded longitudinal studies can be done.

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