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Nevein Mohammed Osama algammal
Future university of egypt, neveen.elgammal@Fue.edu.eg

Nivine Ibrahim Ragy
Faculty of oral and dental medicine, Future University in Eygpt, nragy@fue.edu.eg

Mohammed Wagdy Bissar
Faculty of Dentistry, Ain Shams University and Galala University, Mohamedbissar_1@yahoo.com

Mohammed El-Mofty
Faculty of Dentistry ,Ain Shams University and Al-Nahda University, mofty@dr.com

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Clinical periodontal assessment following the adjunctive use of lycopene and vitamin c in non surgical therapy of chronic periodontitis :A randomized clinical trial

Nevein Mohammed Osama Al-gammal,[a,*] Nivine Ibrahim Ragy,[a] Mohammed Wagdy Bissar,[b] Mohammed El-Mofty,[c]

a Future University in Eygpt),
b Ain Shams University
c Faculty of Dentistry , Al-Nahda University

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* Corresponding author.
E-mail address:
neveen.elgammal@Fue.edu.eg
(Nevein Mohammed Osama Algammal).

ABSTRACT

Objective: To evaluate the clinical outcome of chronic periodontitis patients by clinical measurement of pocket depth (PD) and clinical attachment level (CAL) following non-surgical periodontal treatment with adjunctive use of lycopene and vitamin C.

Subjects and Methods: 42 eligible systemically healthy patients with chronic periodontitis assigned to each group after assessment of clinical parameters plaque index (PI), gingival index (GI), probing depth (PD), clinical attachment loss (CAL), were recorded. Cases were allocated into 3 groups by computerized randomization, 14 patients each group (n = 14). *Group I (Lycopene):* Patients were supplemented with 10 mg lycopene soft gels once daily for 2 months following SRP treatment. *Group II (Vitamin C):* Patients were supplemented with Vitamin C 500mg once daily for two months following SRP treatment. *Group III (Control):* Patients were supplemented with placebo once daily for two months following SRP treatment. All the clinical parameters were assessed at baseline & two months post-treatment.

Results: Overall results of our study, in all groups there were a statistically significant decrease in mean PD, CAL measurements post-treatment (P-value)

Conclusion: Lycopene could be considered as a promising adjunct to SRP treatment in improving periodontal inflammation and clinical outcomes.

1. INTRODUCTION

Periodontitis is defined as chronic multifactorial inflammatory disease attributed to dysbiotic plaque biofilms and described by progressive destruction of the tooth-supporting structure [(1)]. Well-known and preventable biological risk factors which are related to periodontitis was reported in a study by [(2)] (e.g., diabetes, high blood pressure, genetic factors, obesity and high blood cholesterol) also, behavioral risk factors (e.g., an unhealthy diet, physical inactivity, and tobacco use) .According to [(3)], when periodontitis develops, reactive oxygen species, which are overproduced by hyperactive neutrophils mostly, could not be balanced by the body antioxidant defense system and leads to tissues damage. This is characterized by protein damage, increased metabolites of lipid peroxidation, and DNA damage. Chronic periodontitis and chronic gingivitis are stimulated and sustained by the pathogens of the dental plaque. The microbial biofilm comprises up to 150 species in a single person, and up to 800 different species have been identified in humans dental plaque [(4)]. The debate on which species are exactly virulent and can drive disease onset has been for decades and is not finally resolved according to [(5)]. Putative pathogens comprises spirochetes and gram-negative anaerobic bacteria and viruses. It was concluded that, no single pathogen is causative on its own but rather that dysbiosis (an imbalance of the microbial biofilm) by itself is the pathogenic unit[(6)].A systematic review by ***Mombelli et al*** concluded that chronic and aggressive periodontitis could not be distinguished based on specific periodontal pathogens. It was suggested that, the causative microbial biofilm in both diseases are similar [(7)] .

2. MATERIALS AND METHODS

Selection of patients

This study included 42 subjects of systemically healthy patients with chronic periodontitis who were recruited from Clinic of Oral Medicine, Periodontology and Diagnosis Department, Faculty of Dentistry, Ain Shams University and Future University in Egypt. The protocol was explained to the patients and written consent was taken with approval of ethic committee of Ain Shams University.

Cases Classification

Chronic periodontitis patients were classified into three groups by computerized randomization, fourteen patients each group (n=14).

Group I: 14 patients were treated as follows:

PD and CAL were recorded at baseline, patients were undergone non surgical periodontal treatment , followed by 10 mg lycopene supplements for two months .PD and CAL were recorded after two months of treatment.

Group II: 14 patients were treated as follows:

PD and CAL were recorded at baseline , patients were undergone non surgical periodontal treatment, followed by 500 mg Vitamin C supplements for two months .PD and CAL were recorded after two months of treatment.

Group III: 14 patients were treated as follows: PD and CAL were recorded at baseline, patients were undergone non surgical periodontal treatment, followed by placebo intake for two months .PD and CAL were recorded after two months of treatment.

Methods of Assessment

The following clinical parameters were evaluated at baseline & two months after treatment to determine the periodontal status of the subjects: pocket depth (PD) ***(Caton et al., 1980)*** and clinical attachment level (CAL) ***(Ramfjord et al., 1967)*** Measurements were performed at six sites per tooth using a graduated Williams periodontal probe (midbuccal, distobuccal, mesiobuccal, midlingual, mesiolingual and distolingual)**.**

3. REPRESENTATIVE CASE THE PICTURES ARE IN DIFFERENT DIMENSIONS

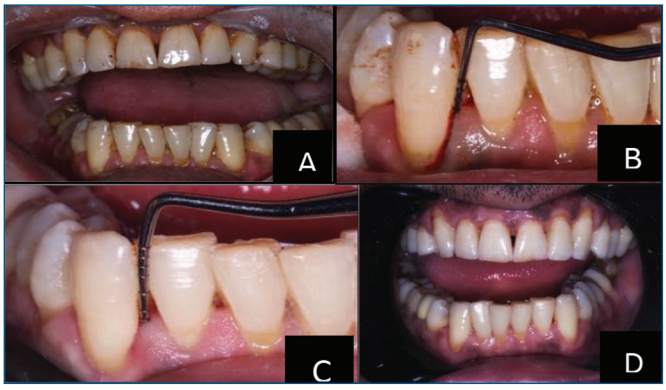

Figure (1): Clinical photographs showing representative case of group I (lycopene)
A:Preoperative photograph B:Preoperative PD measurement
C:Postoperative PD measurement D:Postoperapgh

4. Statistical Analysis

Two-way ANOVA test followed by Kruskal- Wallis test to compare between the three groups. Dunn's test was used for pair-wise comparisons when Kruskal-Wallis test is significant.

5. RESULTS

Decrease in mean PD post-treatment

Pre- as well as post-treatment; there was no statistically significant difference between PD measurements in all compared groups (*P*-value = 0.686). In all groups; there was a statistically significant decrease in mean PD measurements post- treatment (*P*-value <0.001).

Table (1) : Descriptive statistics and results of repeated measures ANOVA test for comparison between PD (mm) in the three groups and the changes by time within each group.

Time	Lycopene (n = 14)		Vitamin C (n = 14)		Control (n = 14)		P-value	Effect size (Partial Eta Squared)
	Mean	SD	Mean	SD	Mean	SD		
Pre- treatment	5.36	0.93	5.5	1.09	5.14	1.23	0.686	0.019
Post-treatment	3.5	0.94	4.144	0.86	4	1.11	0.201	0.079
P-value	<0.001*		<0.001*		<0.001*			
Effect size (Partial Eta Squared)	0.721		0.58		0.495			

**: Significant at P ≤ 0.05*

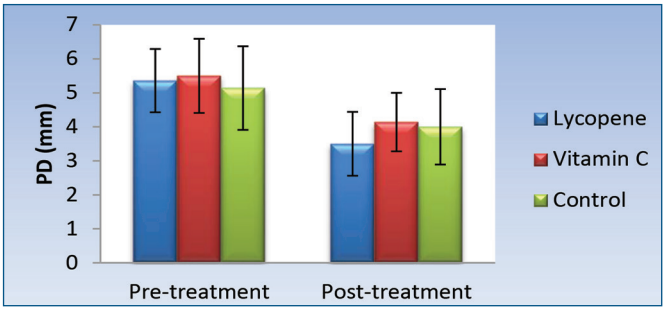

Figure (2): Bar chart representing mean and standard deviation values for PDs in the three groups

CAL gain mean post-treatment

Pre- as well as post-treatment; there was no statistically significant difference between CAL measurements in the three groups (*P*-value = 0.738). In all groups; there was a statistically significant gain in mean CAL measurements post- treatment (*P*-value <0.001).

Table (2): Descriptive statistics and results of repeated measures ANOVA test for comparison between CAL (mm) in the three groups and the changes by time within each group

Time	Lycopene (n = 14)		Vitamin C (n = 14)		Control (n = 14)		P-value	Effect size (Partial Eta Squared)
	Mean	SD	Mean	SD	Mean	SD		
Pre- treatment	5.21	1.19	5.5	1.65	5.07	1.54	0.738	0.015
Post-treatment	3.43	1.02	4.144	1.23	3.93	1.14	0.244	0.07
P-value	<0.001*		<0.001*		<0.001*			
Effect size (Partial Eta Squared)	0.657		0.525		0.44			

**: Significant at P ≤ 0.05*

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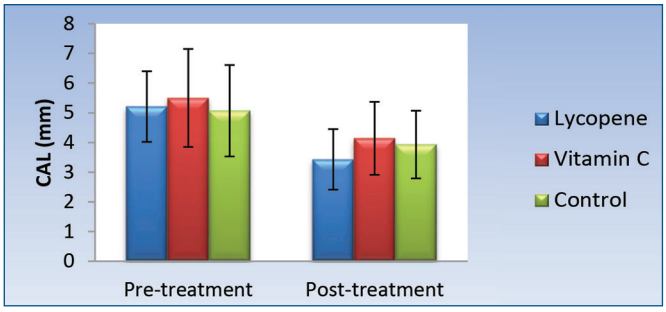

Figure (3): Bar chart representing mean and standard deviation values for CALs in the three groups

7. DISCUSSION

The multiplicity of interactions between the host, microbiota and environment should be considered in periodontal treatment. Therefore, additional approaches and self-care had to be questioned. Clinically, the reduction of the inflammatory pattern to low levels is important to control the periodontal health state. It is important to mention that the inflammation decrease is essential to establish the health of the periodontal tissues [10].

It was worth to mention that in patients with severe inflammatory conditions, the reduction of the inflammatory status is important factor as it contributes to the planning of periodontal health management and/or maintenance of reduced periodontium in regenerative therapies [11].

The objective of this study was to evaluate the effect of lycopene and vitamin C separately as complementary treatment to non-surgical periodontal therapy as the main purpose of non-surgical periodontal treatment is to control periodontal infection by the removal of bacterial biofilm, calculus and also toxins from the periodontally affected root surfaces. Moreover, non-surgical periodontal therapy proven to Pre-treatment Post-treatment decrease the periodontal inflammation, thus reducing the pocket depth and causing gain in the clinical attachment level [12].

The results of the clinical parameters (PD and CAL) were recorded at baseline and 2 months after treatment showed statistical significant decrease in PD and CAL gain in lycopene group than vitamin C & control group. According to [14] this could be explained by the rule of lycopene in decreasing the inflammatory disease due to its anti-inflammatory action that could be related to the induction of inflammatory mediators, such as IL-8, interleukin-1β (IL-1β), IL-6, and tumor necrosis factor-α.

Ambati et al hypothesized that a significant decrease in PD and CAL gain after systemic use of lycopene for 2 months in chronic periodontitis group in comparison to control group which received SRP only. This was in agreement with our study results that showed significant decrease in PD after systemic use of lycopene for 2 months as adjunctive to non surgical periodontal therapy which indicated improvement in the inflammatory status of periodontal disease [15].

A study done by ***Belludi et al*** showed statistically significant improvement in CAL reported in test group had given lycopene supplements as adjunctive to SRP compared to control group received only SRP treatment which is in line with the results of current study that showed improvement of CAL after systemic lycopene as adjunctive to SRP therapy [16].

In the current study there was no statistical significant decrease in PD, CAL between vitamin c and control group which were also stated by [17] who did not find statistical difference between vitamin c group & control group. Also this is in agreement with [18] study which showed the complimentary use of vitamin C (2,000 mg per day for 4 weeks) did not enhance the clinical parameters and plasma TAOC levels following one month post-treatment in comparison to non-surgical therapy alone.

About lycopene the data from systematic review by ***Castro et al*** showed higher efficacy of this carotenoid in comparison to other antioxidants. Furthermore, it was concluded that in periodontal treatment the use of antioxidants as green tea and lycopene are good adjuvants, modulating oxidative stress on the periodontium of periodontitis patients [19]. Therefore, periodontal heath and decrease of inflammatory levels, such as improvement of PI, GI, BOP, and CAL are maintained by antioxidant treatment. This finding was attributed to this compound which has high radical scavenging capability and interferes with other nonoxidizing mechanisms, including anti-inflammatory factors[20].

Within the limits of the present study, lycopene represents an antioxidant and anti-inflammatory characters that could be regarded as an adjunctive treatment to non-surgical periodontal therapy.

8. CONCLUSION

Considering this study, it can be concluded that: Lycopene group showed higher median percent decrease in PD, CAL gain after treatment than vitamin C and control group which might be attributed to the anti-inflammatory action of lycopene. Lycopene could be considered as a promising adjunct to SRP treatment in improving periodontal inflammation and clinical outcome.

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