Effect of antioxidants on progression of periodontal disease
Aditi Mathur, Lalit Mathur, Balaji Manohar, Rajesh Shankarapillai, Hemant Mathur

Abstract
Background: Antioxidant therapy is emerging as a promising new paradigm as prophylactic and therapeutic agents. Aims & Objectives: The aim of this study was to investigate effect of antioxidant therapy on the progression of periodontal disease and to investigate if any correlation exists between antioxidant levels in saliva and periodontal attachment loss. Material and Methods: 15 subjects with CPITN score of above 3 were included in this study. At the baseline periodontal attachment loss was recorded and scaling and root planning was performed. 6mg antioxidants were administered in three divided doses for 2 weeks. Saliva samples were collected at baseline, 15th day, 30th day and 45th day for evaluation of uric acid levels. Results: Uric acid levels were low in patients with more periodontal attachment loss. As the treatment was initiated increase in uric acid levels was observed. The uric acid level and periodontal attachment loss between groups showed a highly significant difference 2.96+0.687 (p value 0.00). Conclusion: A significant correlation was observed between uric acid levels and periodontal attachment loss.

Key Words: Saliva; Uric acid; periodontal attachment loss

Introduction
The reduction of molecular oxygen to hydrogen peroxide is accompanied by a large free energy release that can give rise to free radicals (FR) and reactive oxygen species (ROS). These ROS are a potential double edged sword in disease prevention and promotion. They play a crucial role in normal physiological processes like response to growth factors, immune response and apoptotic elimination of damaged cells while they may also represent an important pathogenic mechanism for tissue damage and disease associated with phagocytic infiltration when generated during respiratory burst. Antioxidants are those substances which when present at low concentrations compared to those of an oxidizable substrate, will significantly delay or inhibit oxidation of that substrate. Hence antioxidants are important to counteract the damage caused by free radicals.

Periodontitis is among the most widespread inflammatory chronic condition which affects oral cavity. It is initiated by sub gingival biofilm but progression depends upon abnormal host response. Now evidences are emerging to implicate these increased FR in pathogenesis of periodontitis as it enhances the tissue destruction.

Uric acid is a major salivary antioxidant, levels of which decrease in periodontitis. The aim of the present study was to investigate effect of antioxidant therapy on progression of periodontal disease.

Materials and Methods
The present study conducted on 55 subjects. Patients with systemic diseases, habit of smoking and pan chewing, subjects on medications like antibiotics and antioxidants were excluded from the study. 15 subjects with comparable plaque and calculus index were included in the study with CPITN scores above 3.

Periodontal attachment level was assessed at 4 sites per tooth and values were averaged to attain a single value for each tooth and similarly a single value was obtained for an individual at baseline, 15th day, 30th day and 45th day. At baseline oral prophylaxis was done combination of antioxidants were administered in a dosage of 6 mg in three divided doses for 2 weeks. Each soft gel of antioxidant was composed of: Lycopene- 2000mcg, Zinc- 7.5 mg, Selenium- 35 mcg. Sample Collection:

1 ml of unstimulated saliva samples were collected by allowing saliva to passively flow into a sterile glass vials after rinsing the mouth with water to wash out the exfoliated cells at the baseline. The samples of saliva from both the groups were collected again after 15, 30 and 45 days of nonsurgical periodontal treatment.

Uric Acid Determination: Uric acid level was evaluated by using reflotron reflectance photometer at a wavelength of 642 nm. Uric acid in the sample is converted into allantoin and hydrogen peroxide. This hydrogen peroxide reacts with indicator 4-(4-dimethylaminophenyl) - 5-methyl-2-(3,5-dimethoxy-4-hydroxyphenyl) imidazole di-
hydrochloride and the depth of colour is determined by the concentration of uric acid in the sample. The periodontal attachment levels and uric acid levels were transferred and charted into SPSS and were individually compared for baseline, 15th day, 30th day and 45th day.

**Results**

The present study focussed on establishing a possible relationship between the estimated uric acid levels in saliva with periodontal attachment loss in a group of 15 patients who were having comparable oral hygiene status and were within an age limit of 30-41 years with a mean age of 33.8 years (table 1).

<table>
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The subjects chosen for this particular study were assessed at baseline, 15th, 30th, and 45th day. The minimum value for uric acid level was found to be 2 mg/dl and maximum was 4.45 mg/dl with a mean of 2.96 mg/dl and uric acid level had standard deviation of 0.687. The periodontal attachment loss showed a minimum value of 2.86 mm and maximum of 6.56 mm while the mean value for whole experiment of periodontal attachment loss was 5.02 mm.

During statistical analysis between the groups an ANOVA and paired t test was done to find out significance of difference between groups and to find out whether any correlation exists between uric acid level and periodontal attachment loss during experimental phase. The uric acid level between baseline control group and experimental groups showed a mean square value of 6.069 in ANOVA. The uric acid level between groups showed a highly significant difference with p value 0.00 and the periodontal attachment loss between baseline and experimental groups showed a mean square value of 10.837 while f value was 28.592. The periodontal attachment loss value differences between groups were also highly significant (Table 2). In the paired correlation analysis between uric acid level and periodontal attachment loss there was a highly significant negative correlation of 0.564 between the baseline, 15th, 30th and 45th day samples. Linear and quadratic correlation regression was done and a significant correlation was seen only on 45th day while baseline, 15th and 30th day did not show any correlation.

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**Discussion**

Antioxidant therapy is emerging as a promising new paradigm as prophylactic and therapeutic agents. These are those agents which scavenge FR or ROS and prevent the damage caused by them. Antioxidants can be classified on the basis of their mode of action (preventative or scavenging), location (intracellular, extracellular or membrane associated) and solubility (water or lipid soluble).

In the present study saliva was used as a diagnostic fluid because it can be collected in a safe and easy way requiring no special training and whole saliva is a mixture of oral fluids, and includes secretions of the major and minor salivary glands, in addition to constituents of non-salivary origin derived from GCF, expectorated bronchial secretions, serum and blood cells from oral wounds, as well as bacteria and bacterial products, viruses and fungi, desquamated epithelial cells and food debris. (5) Uric acid is one of the major radical scavengers within plasma, urine and saliva. Uric acid levels were evaluated in the present study to determine if administration of antioxidants increases the levels of antioxidant present in saliva which may combat the periodontal tissue destruction caused by FR.

Decrease in concentration of uric acid levels in saliva with increase in severity of
periodontal disease was observed similar to a study by Scully et al.(6) Comparing means of uric acid levels between groups it was seen that the mean square value was 6.007 while f value was 35.41 and the ANOVA results showed a significant difference between groups. The periodontal attachment loss also showed a similar pattern with highly significant change in group with f value of 28.59 and mean square value of 0.0984.

The study focussed on establishing correlation between the observed uric acid levels on the baseline, 15th, 30th and 45th day in a longitudinal study pattern to be compared with periodontal attachment loss measurements recorded within groups. For this purpose a correlation regression analysis was done. The baseline correlation (r value 0.046, figure 1) shows no significant correlations between uric acid level and periodontal attachment loss which was expected in a similar study by Diab-Ladki et al (2003).(7)

A similar trend was observed even after the initiation of antioxidant therapy after 2 weeks and 4 weeks (figure 2&3) with no significant correlation between observed salivary uric acid level and periodontal attachment loss measurements. This maybe because antioxidant plasma concentration was not enough to significantly influence the periodontal homeostasis.(8)

But the 45th day correlation regression analysis showed a strikingly important pattern showing the r square value 0.626 (figure 4). Almost all plotted points came close to a linear pattern indicating a strong correlation between uric acid levels at 6th week with periodontal attachment loss measurements (p value -0.564) showing a marker decrease in periodontal attachment loss measurements in response to antioxidant therapy. This result may indicate that a minimum time is required for antioxidants to be effective and active at local sites even though it is demonstrated that systemic action of antioxidants can be exhibited as early as 24 hours.(9)

**Conclusion**

Within the limitations of this study, it can be concluded that further similar case control longitudinal clinical trials may be needed to corroborate the findings of this specific study to evaluate time needed for antioxidant action.

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**References**


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