Effects of Non-Surgical Periodontal Therapy on Salivary Aspartate Aminotransferase Levels in Chronic Periodontitis Patients.

Sura Dakhil Jassim*.

MSc in Periodontology , College of Dentistry, Babylon University, Babylon Province, Iraq.

ABSTRACT

Periodontal disease is a chronic disease of the oral cavity comprising a group of inflammatory conditions affecting the supporting structures of the dentition . The aims of this study were to measure the salivary levels of aspartate aminotransferase in chronic periodontitis patients and subjects with healthy periodontium ,also to evaluate the effects of non surgical periodontal treatment on the salivary levels of aspartate aminotransferase. One milliliter of salivary samples and full-mouth clinical periodontal recordings (plaque index, gingival index, probing pocket depth and clinical attachment loss) were obtained from twenty patients with chronic periodontitis and twenty subjects with healthy periodontium .One month after non surgical periodontal treatment other salivary samples and clinical periodontal recordings were taken from chronic periodontitis patients. All subjects were systemically healthy with age range (30-60) years. Salivary aspartate aminotransferase levels were calculated spectrophotometrically. Statistical analysis revealed that all clinical periodontal parameters decrease after periodontal treatments. Salivary aspartate aminotransferase levels were significantly higher in chronic periodontitis patients than subjects with healthy periodontium and these levels decrease after periodontal treatments. Salivary aspartate aminotransferase levels were significantly positively correlated with clinical periodontal parameters (gingival index, probing pocket depth and clinical attachment level). Salivary aspartate aminotransferase could reflect periodontal disease activity and the response to periodontal treatment.

Keywords: chronic periodontitis, aspartate aminotransferase, periodontal treatment, saliva.

*Corresponding author

INTRODUCTION

Periodontal diseases are a group of inflammatory disorders with complex etiology and multifactorial in origin. The most common form of periodontal diseases is called chronic periodontitis which is irreversible and cumulative condition that damages tissue through the complex interactions between periopathic bacteria and the host defense system(1). Progression and severity of the disease depends on complex interactions between several risk factors such as microbial, immunological, environmental and genetic factors as well as age, gender and race(2).

Using saliva as a diagnosis body fluid for monitoring various biological alternations in human is attracting many researchers worldwide. Human saliva is an easily accessible biochemical fluid, which is similar to blood in various biological aspects. Besides, it associated with simple and non-invasive collection procedures , low-cost storage and easily storage nature.

Biochemical markers plays an important role in the detection of inflammatory changes in short period of time . Saliva contains biomarkers derived from serum, gingival crevicular fluid and mucosal transudate with relatively important diagnostic value, which could be used for detecting

periodontal disorders. Salivary components for periodontal diagnosis include enzymes and immunoglobulins, hormones of host origin, bacteria and bacterial products, ions, and volatile compounds (3).

Intracellular enzymes are increasingly released from the damaged cells of periodontal tissues into the gingival crevicular fluid (GCF) and saliva. Aspartate aminotransferase (AST) is normally found in red blood cells, liver, heart, muscle tissue, pancreas, and kidneys. It is an intracellular enzyme which upon cell death is released extracellularly(4).

Aspartate aminotransferase, formerly called glutamic oxalotransferase (GOT). The enzyme catalyzes the transamination of glutamic acid to oxaloacetic and aspartic acids. During inflammation, AST tissue level rises; it gets into the blood plasma and also by diffusion through salivary glands into saliva. During periodontal inflammation, it also passes into sulcular fluid and then into saliva. AST levels are significantly and positively correlated with the intensity and extent of periodontal inflammation (5).

MATERIAL AND METHOD

Twenty patients (fifteen male and five female) with chronic periodontitis and average age range of 30-60 were selected from those attending Department of Periodontics ,Collage of dentistry ,University of Babylon The patient must have good general health with no history of systemic diseases or smoking , no systemic antibiotic therapy and/or periodontal therapy including scaling or root planning within the last 3 months. Healthy group include 20subjects (thirteen male and seven female)with healthy gingiva . After the patient has been selected, and before the base line examination, salivary samples were collected from chronic periodontitis and healthy groups .The following clinical periodontal parameters were recorded: Plaque index (PLI) (6), gingival index (GI) (7), probing pocket depth(PPD) and clinical attachment loss (CAL). After sample collection and baseline parameters recording were taken , patients with chronic periodontitis were subjected to scaling and root planning .Salivary sampling and clinical periodontal parameters assessment were repeated after 1 month of periodontal treatment.

Salivary sample collection

About 1ml sample of non-stimulated whole saliva was collected from each participant in the study . The participant asked to sit in a comfortable position and spit in a sterile test tube after making them rinse his mouth thoroughly with water . Salivary samples were collected at least 1 hour after the last meal and stored at -20 C˚ till being assessed for aspartate aminotransferase.

Estimation of enzyme activity in saliva

The activity of AST in the collected samples was determined spectrometrically using "Bio systems kit-Spain"

Statistical analysis

To compare the clinical periodontal parameters (plaque index, gingival index and probing pocket depth) and enzymatic activity among healthy , chronic periodontitis before treatment and after treatment groups , one-way Analysis of Variance (ANOVA) was used ; also Least Significant Difference (LSD) was used to compare the means of two groups individually . To compare the clinical attachment loss of chronic periodontitis patients before and after treatment student t-test was used . Correlation between the activities of the salivary aspartate aminotransferase and the values of clinical indices was determined by pearson correlation coefficient.

RESULTS

Aspartate aminotransferase activity:

The activities of aspartate aminotransferase were (32.35± 9.12) , (83.60 ± 20.92) ,(50.75± 8.77) in healthy , chronic periodontitis before and after periodontal treatment groups respectively with highly significant difference between groups (P<0.001) as shown in table (1).

Table 1: Mean and SD of the salivary aspartate aminotransferase in healthy , chronic periodontitis before and after periodontal treatment groups.

Group	AST		P-value
	Mean	SD	
Healthy	32.35	9.12	0.000
Chronic periodontitis before periodontal treatment	83.60	20.92	
Chronic periodontitis after periodontal treatment	50.75	8.77	

Clinical periodontal parameters

The results of this study revealed that there were highly significant differences in plaque index , gingival index and probing pocket depth among healthy , chronic periodontitis before and after treatment groups (P<0.001) as shown in table (2) . Plaque and gingival indices reduced to (0.89±0.28) , (1.22 ±0.38) respectively after periodontal treatment with statistically significant differences when comparing it with the indices before periodontal treatment as shown in table (3). Regarding clinical attachment loss there was highly significant difference between chronic periodontitis patients before and after treatment , the clinical attachment loss were (3.90 ±1.15) and (2.82 ±0.39) before and after periodontal treatment respectively as shown in table (2) .

Table 2: Mean values and standard deviation (SD) of (plaque index, gingival index , probing pocket depth and clinical attachment loss) in healthy , chronic periodontitis before and after periodontal treatment groups.

Parameter	Healthy	Chronic periodontitis before periodontal treatment	Chronic periodontitis after periodontal treatment	
	Mean (SD)	Mean (SD)	Mean (SD)	P-value
PLI	0.57 (0.28)	1.85 (0.55)	0.89 (0.28)	0.000
GI	0.18 (0.08)	1.90 (0.30)	1.22 (0.38)	0.000
PPD	1.79 (0.29)	4.77 (0.39)	3.50 (0.45)	0.000
CAL	-------	3.90 (1.15)	2.82 (0.39)	0.0001

Table 3: Comparison of clinical periodontal parameters and salivary AST between healthy , chronic periodontitis before and after periodontal treatment groups using LSD.

Parameter	Healthy and chronic periodontitis before periodontal treatment		Healthy and chronic periodontitis after periodontal treatment		Chronic periodontitis before and after periodontal treatment	
	Mean difference	P-value	Mean difference	P-value	Mean difference	P-value
PLI	- 1.28	0.000	-0.32	0.014	0.96	0.000
GI	- 1.72	0.000	- 1.04	0.000	0.68	0.000
PPD	- 2.98	0.000	- 1.71	0.000	1.27	0.000
AST	- 51.25	0.000	- 18.40	0.000	32.85	0.000

Correlation between clinical and biochemical parameters:

There were no statistically significant correlations between salivary AST activity and plaque index in all groups , while there were statistically significant positive correlations between AST activity and (gingival index , probing pocket depth and clinical attachment loss) in healthy ,chronic periodontitis before and after treatment groups as shown in table (4).

Table 4: Correlations of salivary aspartate aminotransferase and (plaque index , gingival index , probing pocket depth and clinical attachment loss) in healthy ,chronic periodontitis before and after treatment groups.

	Healthy		chronic periodontitis (before treatment)		chronic periodontitis (after treatment)	
	r	P value	r	P value	r	P value
PLI	.416	0.068	.207	0.381	.365	0.113
GI	.843	0.000	.734	0.000	.668	0.001
PPD	.668	0.001	.631	0.003	.752	0.000
CAL	----	----	.576	0.008	.570	0.009

DISCUSSION

Diagnostic laboratory tests of saliva are routinely used in evaluation of many systemic disorders. Diagnosis of periodontal disease relies primarily on clinical and radio graphical parameters. But these parameters reflect past disease activity not current disease activity, also measurement of these parameters are time-consuming procedures . Numerous bio markers in saliva have been proposed as a diagnostic tests for periodontal disease , aspartate amino transferase is one of these markers. The results of present study showed that plaque index and gingival index reduced after periodontal treatment with statistical significant differences these results were in agreement with (8,9).

Current study also showed that both probing pocket depth and clinical attachment loss reduced after periodontal treatment , these results were in agreement with (10) .

In this study, analysis of salivary AST showed significantly higher levels in patients with chronic periodontitis before periodontal treatment (*P*- value =0.000) and chronic periodontitis after periodontal treatment (*P*- value =0.000), as compared to healthy subjects. These results were in agreement with (11,12).

When comparing the salivary AST levels of chronic periodontitis patients before treatment and after treatment, the level was reduced in chronic periodontitis after treatment with statistically significant differences *(P*- value =0.000). Similar results were reported by (9,13)

Aspartate aminotransferase is an indicator of a higher level of cellular damage and its increased activity in gingival crevicular fluid and saliva is a consequence of its increased release from the damaged cells of soft tissues of periodontium and a reflection of metabolic changes in the inflamed gingiva (14).

In present study, it was also noted that the activities of AST were significantly positively correlated with clinical periodontal parameters (gingival index , probing pocket depth and clinical attachment loss) in healthy , chronic periodontitis before periodontal treatment and after periodontal treatment groups. These results were in agreement with (15 ,16).

Periodontal destruction is associated with the anaerobic microflora resulting in tissue destruction thereby releasing AST in GCF and saliva. Studies conducted by Kuru *et al*.(17) concluded that Porphyromonas gingivalis, Aggregetibacter actinomycetemcomitans, and Prevotella intermedia (which are important periodontal pathogens) were significantly higher in AST positive than negative sites.

CONCLUSION

The present study provides evidence that activities of AST were significantly increased in the saliva of patients with chronic periodontitis in relation to healthy subjects ,and these activities significantly reduced after periodontal therapy. It was also established that there was a correlation between the enzyme activity and clinical periodontal parameters. From the present study, it can be concluded that AST can be used as a biochemical marker to accesses the condition of periodontal tissues .

REFERENCES

[1]   Michael G. Newman, Henry Takei, Perry R. Klokkevold and Fermin A. Carranza. Carranza's Clinical Periodontology, 12th Edition. Elsevier, Saunders , 2014.
[2]   Nunn ME. Understanding the etiology of periodontitis: an overview of periodontal risk factors. J Periodontol 2000 2003; 32: 11-23.
[3]   Shu L, Guan SM, Fu SM, Guo T, Cao M, Ding Y. Estrogen Modulates Cytokine Expression in Human Periodontal Ligament Cells. J Dent Res. 2008;87:142–7.
[4]   Eley BM, Cox SW. Advances in periodontal diagnosis. Potential markers of cell death and
[5]   tissue degradation. Br Dent J 1998;184(9):427-30.
[6]   Chambers D. A., Imrey P. B.,.Cohen R. L,Crawford J.M, Alves M. E., McSwiggin T. A. A longitudinal study of aspartate aminotransferase in human gingival crevicular fluid . *Journal of Periodontal Research*. 1991; 26(2): 65–74.
[7]   Silness J, Loe H. Periodontal disease in pregnancy. II. Correlation between oral hygiene and periodontal condition. J Acta Odontol Scand 1964; 22: 121-135.
[8]   Loe H, Silness J. Periodontal disease in pregnancy. I. Prevalence and severity. J Acta Odontol Scand 1963 ; 21: 533-551.
[9]   Elif Oncu. et al. The Effects of Non Surgical Periodontal Therapy on Total Antioxidant Status, Total Oxidative Status and IL-6 Levels in Gingival Crevicular Fluid and Serum of Hyperlipidemic Smokers. J Dent & Oral Care 2015; 1(2): 1-6.
[10]   Dabra S, China K, Kaushik A. Salivary enzymes as diagnostic markers for detection of gingival/periodontal disease and their correlation with the severity of the disease. J Indian Soc Periodontol 2012;16:358-64.
[11]   Gonçalves D , Correa FO, Khalil NM, de Faria Oliveira OM, Orrico SR .The effect of non-surgical periodontal therapy on peroxidase activity in diabetic patients: a case–control pilot study. J Clin Periodontol 2008; 35: 799–806
[12]   Dewan A , Bhatia P . Evaluation of aspartate aminotransferase enzyme levels in saliva and gingival crevicular fluid with periodontal disease progression - A pilot study. *J. Int Oral Health* 2011 ;3(3).
[13]   Ebele J , Emeka E , Ignatius C , Emeka G, Nochie S. Periodontal disease and type 2 diabetes: effects on salivary enzyme activities Int J Diabetes Dev Ctries 2011; 31(1):9–13.
[14]   Yoshie H, Tai H, Kobayashi T, Oda-Gou E, Nomura Y, Numabe Y. Salivary enzyme levels after Scaling and Interleukin 1 genotypes in Japanese patients with chronic periodontitis. J Periodontol 2007;78:498-503.
[15]   Zappa U. Histology of the periodontal lesion: Implications for diagnosis. Periodontol 2000. 1995;7:22–38.16.

[16]   Kudva P, Saini N, Kudva H, Saini V. To estimate salivary aspartate aminotransferase levels in chronic gingivitis and chronic periodontitis patients prior to and following non-surgical periodontal therapy: A clinico-biochemical study. J Indian Soc Periodontol 2014;18:53-8.

[17]   Luke R, Nubesh Khan S, Iqbal PS **,** Soman RR, Chakkarayan J, Krishnan V. Estimation of Specific Salivary Enzymatic Biomarkers in Individuals with Gingivitis and Chronic Periodontitis: A Clinical and Biochemical Study . Journal of International Oral Health 2015; 7(9):54-57 .

[18]   Kuru B, Yilmaz S, Noyan U, Acar O, Kadir T. Microbiological features and crevicular fluid aspartate aminotransferase enzyme activity in early onset periodontitis patients. J Clin Periodontol 1999;26:19-25. 34.