The association of crevicular albumin level with the severity of periodontal destruction in chronic periodontitis patients after initial periodontal treatment

Raghad Fadhil, B.D.S., M.Sc. [1]

ABSTRACT

Background: Gingival crevice fluid (GCF) is a mixture of substances derived from serum, leukocytes, and structural cells of periodontium and oral bacteria. These substances possess a great potential for serving as indicators of periodontal disease and healing after therapy the main purpose of this study was to find if there is a difference in albumin concentration between healthy and diseased periodontal tissues and to compare between diseased group according to pocket depth

Materials and methods: total sample composed of 60 pockets found in 35 patients all of them had no history of any systemic disease, The samples were divided in to three main group that include two diseased groups divided according to the depth of the periodontal pocket (group I were the pocket depth less than 6mm and group II were the pocket depth is equal or more than 6mm) and one healthy group (group III). Sampling of GCF were taken from patients in the second visits of periodontal treatment A previously weighed strips of filter paper size 30 were gently inserted in to the selected pocket depth until resistance was felt the filter paper left in place for 30 seconds and after removal they were weighed on a chemical balance. The difference between the weights of filter paper before and after absorption of exudates was calculated and each filter strips was placed in a tube containing o.3ml of normal saline then transferred and stored at -20C.on the day of analysis the samples were centrifuged at 10.000rpm for 20 minutes .the supernatant was used for assessment of Albunim colorimetrically similar to that of blood.

Results: Comparison for gingival fluid weight were shown a non significant difference in the weight between group I&II at a P values >0.05 while there were a highly significant difference between group I&III and between group II&III at P values <0.000 While comparison for albumin concentration in gingival fluid by using t-test and f test show a non significant difference for all groups at p values >0.05 intra groups correlation between albumin content in gingival fluid and periodontal parameter there were a significant negative correlation between plaque index and albumin in group I and II while anon significant correlation in group III also a significant and highly significant correlation were found between albumin and weight of gingival fluid in group I and II while anon significant differences in group III as shown in the table while there were anon significant differences between albumin content of gingival fluid and the gingival index, probing pocket depth and clinical attachment loss.

Conclusion: the gingival crevicular fluid is an aqueous component in which is true trasudate and inflammatory exudates after the initial periodontal treatment in which it increased in weight as the inflammation present but the concentration of albumin may became a no significantly different compared with clinically healthy gingiva. As the initial periodontal treatment took place for each patients.

Keywords: Albumin and periodontal disease, gingival fluid, chronic periodontitis, albumin level in gingival fluid. **(J Bagh Coll Dentistry 2014; 26(1):134-137).**

الخلاصة:

الهدف الرئيسي لاجراء هذه الدراسة كان لايجاد الاختلاف بين تركيز الالبومين الموجود في السلئل اللثوي بين الاصحاء والمرضى المصابين بالتهاب اللثة وماحول الاسنان لقد جمعت العينات من 60 جيب لثوي وجدت لدى 35 مراجع قسموا الى ثلاث مجاميع كل مجموعة تكونت من عشرين عينة ،جميع متغيرات ماحول الاسنن سجلت للمقرنة بين المجاميع الثلاثة ولغرض اخذ العينة من السائل اللثوي استخدمنا شرائح من ورق الترشيح ووضعت بشكل هادئ في الاخدود اللثوي وبعد اخذ العينة من السائل اللثوي كانت توضع العينة في الماء المقطر لاحتساب كمية الالبومين الموجود في كل عينة .لقد تم استخدام الاحصاء الوصفي والتحليلي لاظهار النتائج وقد كان هناك فرق معنوي بين مجموعة الاصحاء ومجموعة المرضى من ناحية الوزن المحتسب لكمية السائل اللثوي المجموعة ولكن لم يكن هنالك اي فرق من ناحية تركيز الالبومين المجموع بين مجاميع المرضو الاصحاء كما وجد ان هنالك علاقة سلبية قوية بين متغيرات ماحول الاسنان وتلركير الالبومين في السائل اللثوي ربما هذه النتائج تعزو الى استخدام العلاج الاولي والوقائي لامرض اللثة قبل البدء بعملية جمع السائل اللثوي

INTRODUCTION

Gingival crevice fluid (GCF) is a mixture of substances derived from serum, leukocytes, and structural cells of periodontium and oral bacteria. These substances possess a great potential for serving as indicators of periodontal disease and healing after therapy [1]. The use of GCF volume as an aid in the diagnosis of periodontal status was proposed many years ago by Golub and Kleinberg in 1976[2].

They have demonstrated a significant relationship between GCF volume and the severity of periodontal inflammation associated with gingivitis or periodontitis. In particular, positive correlations between GCF volume and clinical parameters, such as probing pocket depth, and successful periodontal treatment have been reported [3].

Gingival crevicular fluid capacity to carry high moleclular weight compounds such as proteins has confirmed and that the gingival fluid is an inflammatory exudates as a result of increased capillary permeability [4] . Studies have suggested that determining the level of inflammatory mediators in biologic fluids indicates inflammatory activity [10]. Numerous studies have

(1)Lecturer. Department of Periodontics, College of Dentistry, Baghdad University.

shown that biomarkers of inflammatory response are elevated in people with periodontitis compared with healthy controls [12,13] . Kardeşler et al proved that clinical improvements are less apparent in diabetic chronic periodontitis patients as reflected by disease markers in GCF and by an increase in concentrations of inflammatory proteins IL-6 and albumin in GCF of this patient group following initial periodontal treatment [11]. Mann and Stofler in 1964 reported the presence of albumin in gingival fluid [7]. In1985 a study was done by collection of Unstimulated, resting crevicular fluid from healthy crevicular spaces (i.e. in the absence of clinically detectable inflammation) of dogs and humans was collected for 3 minutes, either in microcapillary glass tubes or with the aid of filter paper strips. Quantification of proteins was done by radial immunodiffusion without the pooling of samples or by immunoelectrophoresis, without eluting from the papers. The concentrations of albumin and fibrinogen in crevicular fluid so determined proved to be significantly lower than plasma concentrations. These results strengthen the concept that capillary dynamics in healthy gingivae are similar to those in general tissue capillary beds and that gingival fluid is a plasma transudate. However, due to ever present sub-clinical inflammation and other factors, it is improbable that fluid from even healthy sulci is a true transudate [5,6].

The main purpose of this study was to find if there is a difference in albumin concentration between healthy and diseased periodontal tissues and to compare between diseased groups according to pocket depth.

MATERIALS AND METHODS

Sample

Total sample composed of 60 pockets found in 35 patients all of them had no history of any systemic disease, they were well informed about the aim of investigation and they were free to accept or refuse to be examined all of them were selected from subjects attending periodontal department in the college of dentistry at Baghdad University. The samples were divided in to three main groups that include two diseased groups divided according to the depth of the periodontal pocket (group I were the pocket depth less than 6mm and group II were the pocket depth is equal or more than 6mm) and one healthy group(group III)

Periodontal assessments

The periodontal examination were performed on a dental chair, the periodontal variables were recorded on four sites (mesial, distal, buccal and lingual)for all teeth these parameters include: plaque index (PI) (Silness and Leo 1964), gingival index (GI) (Loe 1967), probing pocket depth(PPD):- is defined as the distance from the gingival margin to the most apical penetration of periodontal probe inserted in to the gingival crevice. Clinical attachment loss (CAL): Is defined as the distance from cement enamel junction to the location of the inserted probe tip.

Sampling of gingival fluid for Albumin analysis

Sampling of GCF were taken from patients in the second visits of periodontal treatment (after the patient had received supra gingival scaling and polishing and received good oral hygiene instructions in the first visit) to avoid bleeding occurrence during the collection of gingival fluid. In the first and second groups (Group I and Group II) the teeth had a pocket depth more or equal to 4mm while in the third group (Group III) the gingival tissues were clinically healthy and no pocket or loss of attachment were present. Prior to the sampling the teeth were thoroughly cleaned from plaque without causing damage to the gingivae. Then the teeth and gingivae were carefully dried before the collection of the exudates started. A previously weighed strips of filter paper size 30 were gently inserted in to the selected pocket depth until resistance was felt the filter paper left in place for 30 seconds and after removal they were weighed on a chemical balance , The difference between the weights of filter paper before and after absorption of exudates was calculated and each filter strips was placed in a tube containing o.3ml of normal saline then transferred and stored at -20C.on the day of analysis the samples were centrifuged at 10.000rpm for 20 minutes .the supernatant was used for assessment of Albunim colorimetrically similar to that of blood**.**

Statistical analysis

Both descriptive and inferential statistics were used. The descriptive statistics include: mean, standard deviation (SD), minimum and maximum while inferential statistics include t-test, and Pearson's (r) for correlation.

RESULTS

Sixty (60) sites were included in the study (40 sites were had periodontal pockets equal or more than 4mm and 20 sites were clinically healthy gingiva). The descriptive statistics for periodontal parameters were as follow in tables 1,2,3,4,5,6:- :Table (1) show the highest level of mean plaque index was found in group I as it was 1.22

Table 1: Descriptive statistics for plaque index

Groups	Min	Max	Mean	SD
Group I	0.8	1.8	1.22	0.40±
Group II	0.5	1.7	0.96	0.44±
Group III	0.3	0.8	0.46	0.13±

In table (2), the mean of gingival index were 1.21, 1.51 and 0.47 for groups I,II and III respectively as shown below.

Table 2: Descriptive statistics for gingival index

Groups	Min	Max	Mean	SD
Group I	1.	1.6	1.21	0.21±
Group II	1.	1.5	1.15	0.31±
Group III	0.3	0.6	0.47	0.12±

The minimum and maximum level for clinical attachment loss and probing pocket depth were in group II as shown in table (3and 4).

Table3: Descriptive statistics for clinical attachment loss in all groups

Groups	Min	Max	Mean	SD
Group I	4	8	6.4	1.40±
Group II	6	9	7.12	1.06±
Group III	0	0	0	0

Table4: Descriptive statistics for probing pocket depth in all groups

Groups	Min	Max	Mean	SD
Group I	4	5	4.4	0.51±
Group II	6	9	6.15	0.81±
Group III	0	0	0	0

The concentration of albumin was at maximum level in group I as it was 502µg\mg while the minimum concentration was found in group III as it was 150 µg\mg as shown in table 5

Table 5: Descriptive statistics for Albumin in gingival fluid mg\mg in all groups

Groups	Min	Max	Mean	SD
Group I	168	502	402	100.73±
Group II	180	382	285.13	63.44±
Group III	150	320	230	50.7±

The highest mean of gingival fluid was found in group I as it was 1µg\mg while the lowest mean was 0.4 µg in group II

Table 6: Descriptive statistics for weight of gingival fluid in µg\ mg for all groups

Groups	Min	Max	Mean	SD
Group I	0.5	1	0.592	0.175±
Group II	0.4	0.7	0.588	0.142±
Group III	0.1	0.4	0.211	0.083±

Comparison for gingival fluid weight were shown in table (7) and there were a non significant difference in the weight between group I&II at a P values >0.05 while there were a highly significant difference between group I&III and between group II&III at P values <0.000 as shown in table (7)

Table 7: The difference in the gingival fluid weight for all group by using t-test

Groups	t- test	Sig
Group I & group II	0.807	NS
Group I& group III	0.000	HS
Group II & group III	0.000	HS

Comparison for albumin concentration in gingival fluid by using t-test shows a non significant difference for all groups at p values >0.05as shown in table (8&9)

Table 8: t- test between groups for albumin content in gingival fluid

Groups	t- test	Sig
Group I & group II	0.624	NS
Group I& group III	0.537	NS
Group II & group III	0.785	NS

Table 9 shows intra groups correlation between albumin content in gingival fluid and periodontal parameter there were a significant negative correlation between plaque index and albumin in group I and II while anon significant correlation in group III also a significant and highly significant correlation were found between albumin and weight of gingival fluid in group I and II while anon significant differences in group III as shown in the table while there were anon significant differences between albumin content of gingival fluid and the gingival index, probing pocket depth and clinical attachment loss.

Table 9: Correlation of albumin with plaque index, gingival index and weight.

Pearson correlation	PI&AL	GI&AL	AL&W	AL&PPd	AL&CAL
Group I	-0.672 (S)	-0.320 (NS)	-0.688 (S)	0.084 (NS)	0.673 (S)
Group II	-0.562 (S)	0.088 (NS)	-0.739 (HS)	0.052 (NS)	0.49 (S)
Group III	-0.068 (NS)	-0.066 (NS)	-0.263 (NS)	-	-

DISCUSSION

The descriptive statistics for the albumin show the concentration of albumin in all groups it was lowest in the group III (healthy group) and highest in group II (sever pocket depth group)as the probing pocket depth was present in group II and group I while group III was clinically healthy but the inter group comparison for albumin content of gingival fluid by using t- test show a non significant difference between healthy group (group III) and diseased group (group II&I) as well as anon significant differences between group I and group II this was may be due to initial periodontal treatment which was done before the collection of gingival fluid for all patients in group I and group II they were had scaling and polishing and oral hygiene instructions for good plaque control one week before the collection time each site included in the study should show a gingival index score 1 and no bleeding on probing to avoid bleeding occurrence at the time of collection all this may lead to changing the constituent concentrations of gingival fluid as treatment took place for the patients since the inflammation was reduced mostly at the site of collection although there was a significant differences in the weight of gingival fluid between healthy group and other groups this is supported by Shaprio et al whose found that the amount of GCF is greater when inflammation is present [9] and some times proportional to the severity of inflammation [8] which mean that the amount of fluid did not reduced after initial periodontal treatment but the concentration of albumin in group I and group II became similar to group III as shown in the results These results support the hypothesis that, in an early inflammatory response, the fluid is not a typical inflammatory exudates and is probably modulated by an osmotic gradient[6]the correlation between albumin in gingival crevicular fluid and periodontal parameter show a significant and a highly significant correlation with plaque index and a clinical attachment loss in group I and II while anon significant correlation in group III as well as there was a significant correlation of albumin with the weight of gingival fluid in group I and group II while anon significant correlation for gingival index and probing pocket depth in all groups this was in agreement with Bang and Cimasoni [4] who found a non significant correlation between the concentration of proteins in gingival crevicular fluid and the severity of gingivitis, pocket depth in a conclusion the gingival crevicular fluid is an aqueous component in which is true trasudate and inflammatory exudates after the initial periodontal treatment in which it increased in weight as the inflammation present but the concentration of albumin may became a no significantly different compared with clinically healthy gingiva. As the initial periodontal treatment took place for each patients.

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